

## FCC Part 15.247

# TEST REPORT

For

## Sensys Networks, Inc.

1608 Fourth Street, Suite 200, Berkeley, CA 94710, USA

**FCC ID: TDB-MAG3**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Vehicle Sensor
<b>Report Producer :</b> <u>Lynette Wen</u>	
<b>Report Number :</b> <u>RXZ221223002RF01</u>	
<b>Report Date :</b> <u>2023-12-21</u>	
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### Revision History

Revision	No.	Report Number	Issue Date	Description	Author/ Revised by
0.0	RXZ221223002	RXZ221223002RF01	2023-12-21	Original Report	Lynette Wen

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# 1 General Information

## 1.1 Product Description for Equipment under Test (EUT)

Manufacturer	Sensys Networks, Inc.
	1608 Fourth Street, Suite 200, Berkeley, CA 94710, USA
Brand(Trade) Name	Sensys Networks
Product (Equipment)	Wireless Vehicle Sensor
Main Model Name	VSN240-F-3
Series Model Name	VSN240-T-3
Model Discrepancy	Please refer to the difference declaration letter provided by the manufacturer.
Frequency Range	SRD Mode: 2405 ~ 2480 MHz
Conducted Peak Output Power	0.67 dBm
Modulation Technique	OQPSK
Power Operation (Voltage Range)	<input type="checkbox"/> AC Type <input type="checkbox"/> Adapter I/P: 100-240Vac,1.2A ; O/P: 12Vdc, 3A <input type="checkbox"/> By AC Power Cord <input type="checkbox"/> PoE
	<input checked="" type="checkbox"/> DC Type: 3.6V <input checked="" type="checkbox"/> Battery <input type="checkbox"/> DC Power Supply <input type="checkbox"/> External from USB Cable <input type="checkbox"/> External DC Adapter
	<input type="checkbox"/> Host System
Received Date	Dec 26, 2022
Date of Test	Dec 27, 2022 ~ Dec 21, 2023

\*All measurement and test data in this report was gathered from production sample serial number: RXZ221223002-01 (Assigned by BAACL, New Taipei Laboratory).

## 1.2 Objective

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

## 1.3 Related Submittal(s)/Grant(s)

N/A

## 1.4 Test Methodology

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

## 1.5 Statement

Decision Rule: No, (The test results do not include MU judgment)

It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory).

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

## 1.6 Measurement Uncertainty

Parameter		Uncertainty
RF output power, conducted		±0.93 (dB)
Power Spectral Density, conducted		±0.92 (dB)
Occupied Bandwidth		±0.35 (MHz)
Unwanted Emissions, conducted		±1.69 (dB)
Emissions, radiated	30 MHz~1GHz	±5.22 (dB)
	1 GHz~18 GHz	±6.12 (dB)
	18 GHz~40 GHz	±4.99 (dB)
Temperature		+/- 1.27 °C
Humidity		+/- 3 %

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor  $K$  with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty

## 1.7 Environmental Conditions

Test Site	Test Date	Temperature (°C)	Relative Humidity (%)	ATM Pressure (hPa)	Test Engineer
Radiation Spurious Emissions	2022/12/27~2023/12/21	18.1~24.1	60~69	1010	Jim
Conducted Spurious Emissions	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Jim
6 dB Emission Bandwidth	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Andy Cheng / Jing
Occupied bandwidth	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Andy Cheng / Jing
Maximum Output Power	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Andy Cheng / Jing
100 kHz Bandwidth of Frequency Band Edge	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Andy Cheng / Jing
Power Spectral Density	2023/1/12~2023/12/14	25.4~25.9	58~68	1010	Andy Cheng / Jing

## 1.8 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) to collect test data is located on

☒70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

## 2 System Test Configuration

### 2.1 Description of Test Configuration

For SRD mode, there are totally 16 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2405	8	2445
1	2410	9	2450
2	2415	10	2455
3	2420	11	2460
4	2425	12	2465
5	2430	13	2470
6	2435	14	2475
7	2440	15	2480

For SRD Modes were tested with channel 0, 7, 14 and 15.

The system was configured for testing in engineering mode, which was provided by manufacturer.

### 2.2 Equipment Modifications

No modification was made to the EUT.

### 2.3 EUT Exercise Software

The test software was used “Putty”

Test Frequency	2405 MHz	2440 MHz	2475 MHz	2480 MHz
Power Level Setting	Default	Default	Default	9

### 2.4 Support Equipment List and Details

Description	Manufacturer	Model Number
NB	DELL	E6410
Fixture	SENSYS NETWORKS	SENSYS ROCKET SENSOR TEST JIG
DC Power Supply	KIKUSUI	PMC35-2

### 2.5 External Cable List and Details

Description	Length	From	To
USB Cable	1.5m	NB	Fixture
Power Cable	1m	Fixture	DC Power Supply
Data Cable	0.2m	EUT	Fixture



### 2.6 Test Mode

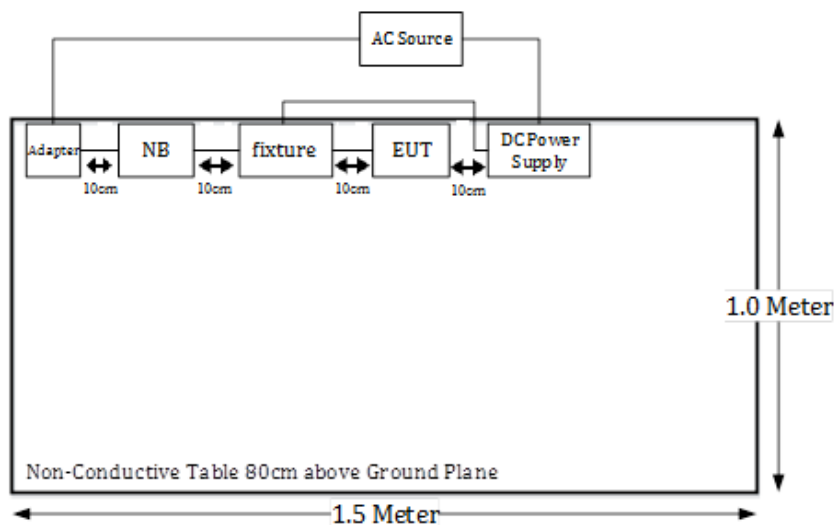
Full System (model: VSN240-F-3) for all test item.

### 2.7 Block Diagram of Test Setup

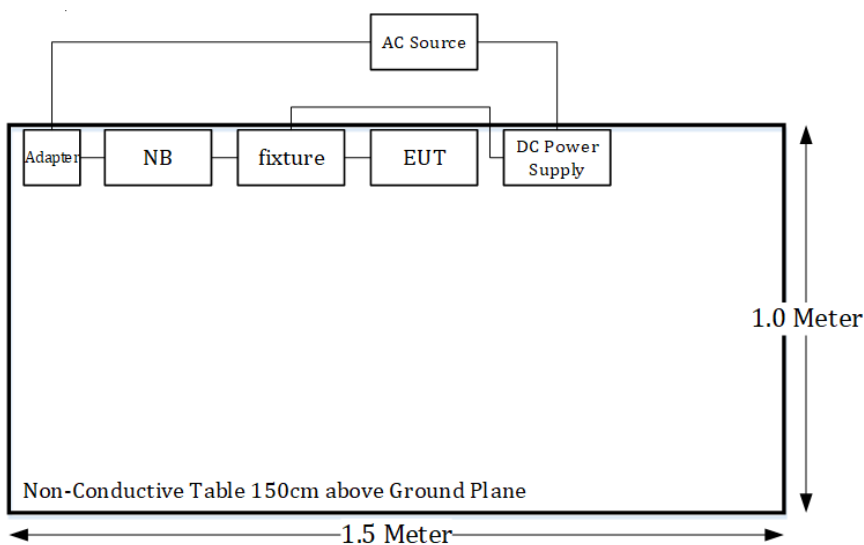
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

#### Radiation:

Below 1GHz:

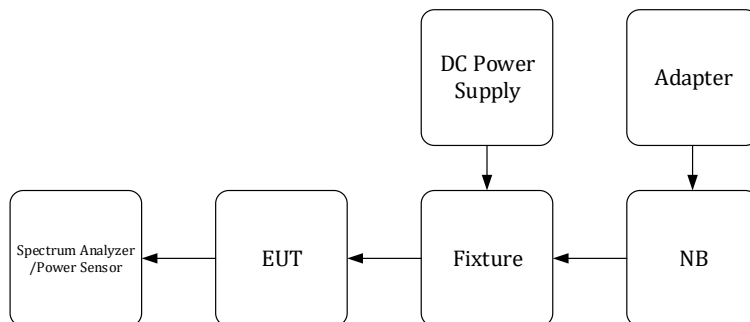


Above 1GHz:



Note: the support table edge was flush with the center of turntable.

**Conducted:**



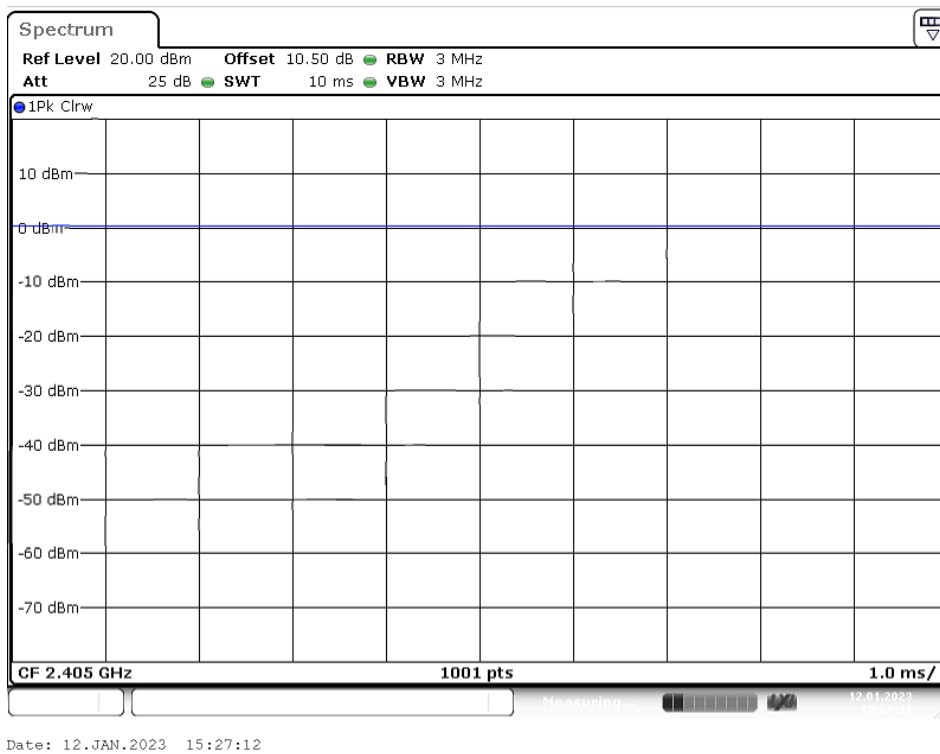
**2.8 Duty Cycle**

The duty cycle as below:

Radio Mode	Time on (ms)	Time on + Time off (ms)	Duty Cycle (%)
SRD	100	100	100

Please refer to the following plots.

**SRD Mode**



### 3 Summary of Test Results

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Results</b>
§15.247(i), §1.1307(b)(3)(i)	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Not applicable
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

Not applicable: The EUT is powered by batteries.

### 4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation 3M Room (966-A)					
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2022/2/14	2023/2/13
				2023/1/31	2024/1/30
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2022/11/2	2023/11/1
				2023/9/27	2024/9/26
Horn Antenna	EMCO	SAS-571	1020	2022/5/25	2023/5/24
				2023/5/18	2024/5/17
Horn Antenna	ETS-Lindgren	3116	62638	2022/8/18	2023/8/17
				2023/8/25	2024/8/24
Preamplifier	Sonoma	310N	130602	2022/6/16	2023/6/15
				2023/6/16	2024/6/15
Preamplifier	A.H. system Inc.	PAM-0118P	470	2022/3/28	2023/3/27
				2023/3/24	2024/3/23
Microwave Preamplifier	EM Electronics Corporation	EM18G40G	60656	2023/1/6	2024/1/5
Spectrum Analyzer	Rohde & Schwarz	FSV40	101606	2022/9/13	2023/9/12
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2023/1/31	2024/1/30
Micro flex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2022/1/24	2023/1/23
				2023/1/24	2024/1/23
Coaxial Cable	COMMATE	PEWC	8Dr	2022/12/24	2023/12/23
Coaxial Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2022/1/24	2023/1/23
				2023/1/24	2024/1/23
Coaxial Cable	JUNFLON	J12J102248-00-B-5	AUG-07-15-044	2022/12/24	2023/12/23
Cable	EMC	EMC105-SM-SM-10000	201003	2022/1/24	2023/1/23
				2023/1/24	2024/1/23
Software	AUDIX	E3	18621a	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101140	2022/2/18	2023/2/17
				2023/2/9	2024/2/8
Cable	UTIFLEX	UFA210A	9435	2022/10/3	2023/10/2
				2023/10/2	2024/10/1
Power Sensor	KEYSIGHT	U2021XA	MY58140006	2022/11/2	2023/11/1
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2023/2/2	2024/2/1
Attenuator	MINI-CIRCUITS	BW-S10W5+	1419	2022/2/11	2023/2/10
				2023/2/1	2024/1/31

**\*Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements.

## 5 FCC §1.1307(b)(3)(i) - RF EXPOSURE

### 5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R <sup>2</sup> .
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup> .
30-300	3.83 R <sup>2</sup> .
300-1,500	0.0128 R <sup>2</sup> f.
1,500-100,000	19.2R <sup>2</sup> .

### 5.2 RF Exposure Evaluation Result

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
SRD 2.4GHz	2480	0.7	3.3	200	1.17	1.85	1.53

§ 1.1307(b)(3)(i)(A) method is not applicable.

§ 1.1307(b)(3)(i)(C)

Band	Freq (MHz)	$\lambda/2\pi$ (mm)	Distances applies	ERP Limit (mW)	Result Option C
SRD 2.4GHz	2480	19.25	apply	768.00	exempt

The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates

ERP (watts) is no more than the calculated value prescribed for that frequency

R must be at least  $\lambda / 2\pi$

$\lambda$  is the free-space operating wavelength in meters

**Result:** The device meets the exemption requirement.

## 6 FCC §15.203 – Antenna Requirements

### 6.1 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.

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 does not exceed 6dBi.

### 6.2 Antenna Information

Manufacturer	Model	Type	Antenna Gain
CiRO	Mag2	Ceramic Patch	3.3 dBi

**Result: Compliance**

## 7 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

### 7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	608 – 614	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	960 – 1240	5. 35 – 5. 46
2.1735 – 2.1905	16.80425 – 16.80475	1300 – 1427	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1435 – 1626.5	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1645.5 – 1646.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1660 – 1710	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1718.8 – 1722.2	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	2200 – 2300	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2310 – 2390	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2483.5 – 2500	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2690 – 2900	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3260 – 3267	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3.332 – 3.339	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3 3458 – 3 358	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3.600 – 4.400	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

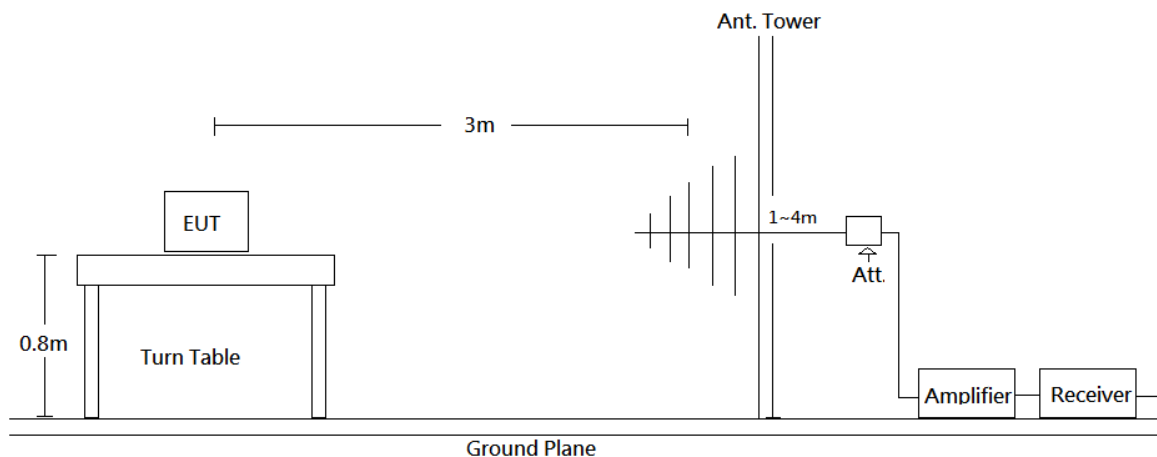
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the



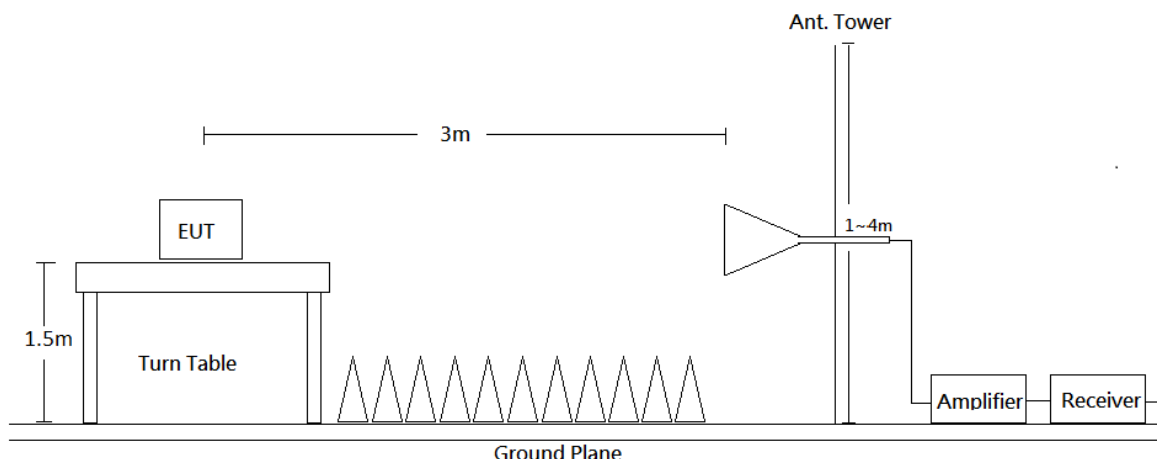
intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the 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)).

### 7.2 EUT Setup

Below 1 GHz:



Above 1 GHz:



### 7.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	/	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	>98%	Ave
	1 MHz	1/T	<98%	Ave

Note: T is minimum transmission duration

### 7.4 Test Procedure

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

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### 7.5 Corrected Factor & Margin Calculation

The Correct Factor 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:

$$\text{Correct Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Level} - \text{Limit}$$

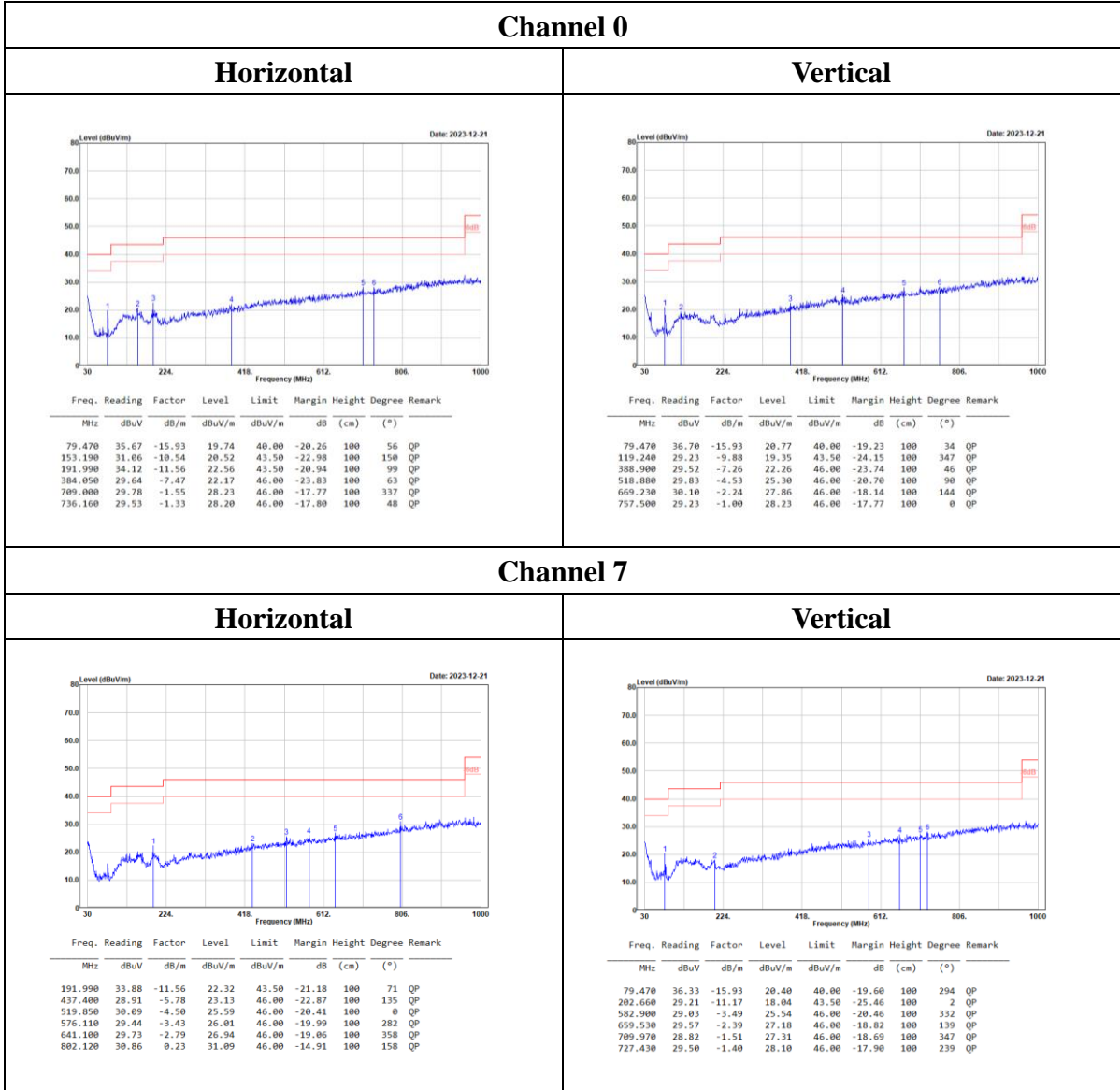
### 7.6 Test Results

Test Mode: Transmitting

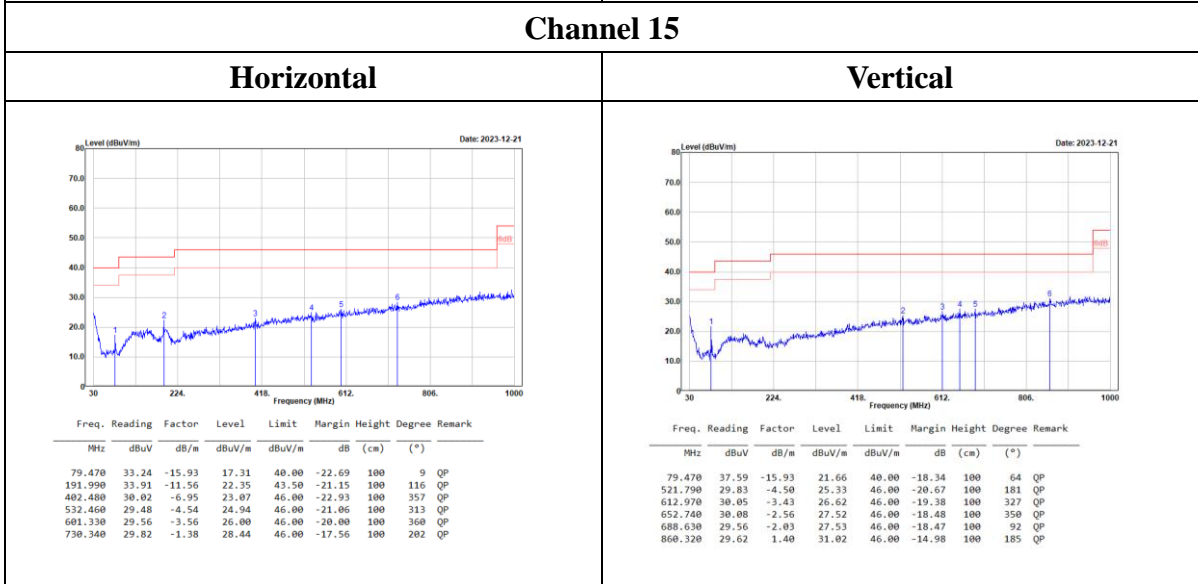
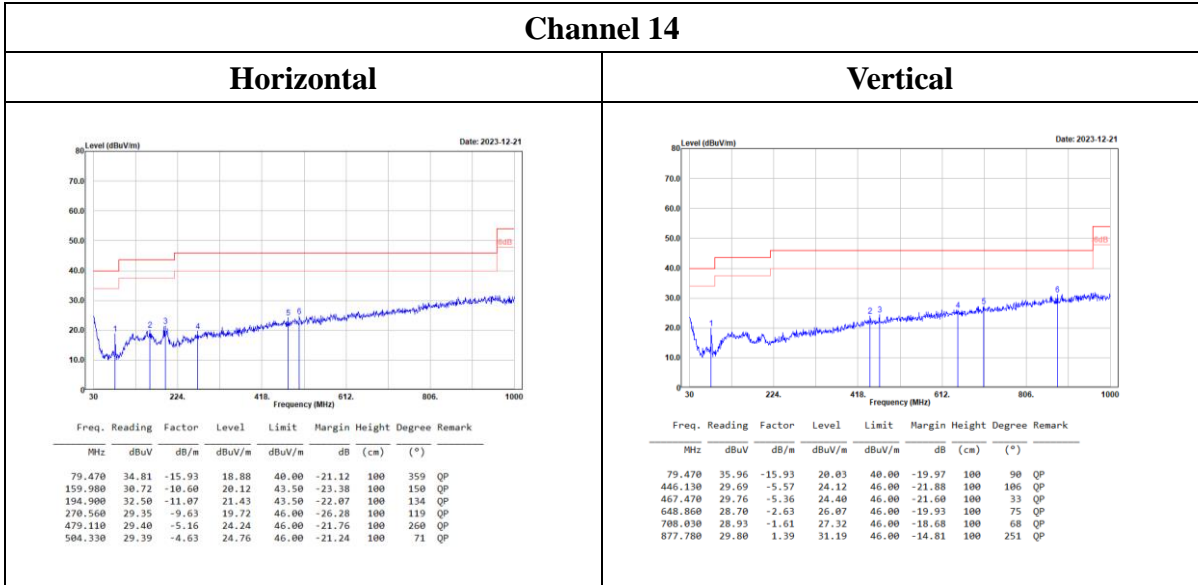
#### SRD Mode

(Pre-scan with three orthogonal axis, and worse case as Y axis.)

30MHz-1GHz:



Note: It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory)



Level = Reading + Factor.

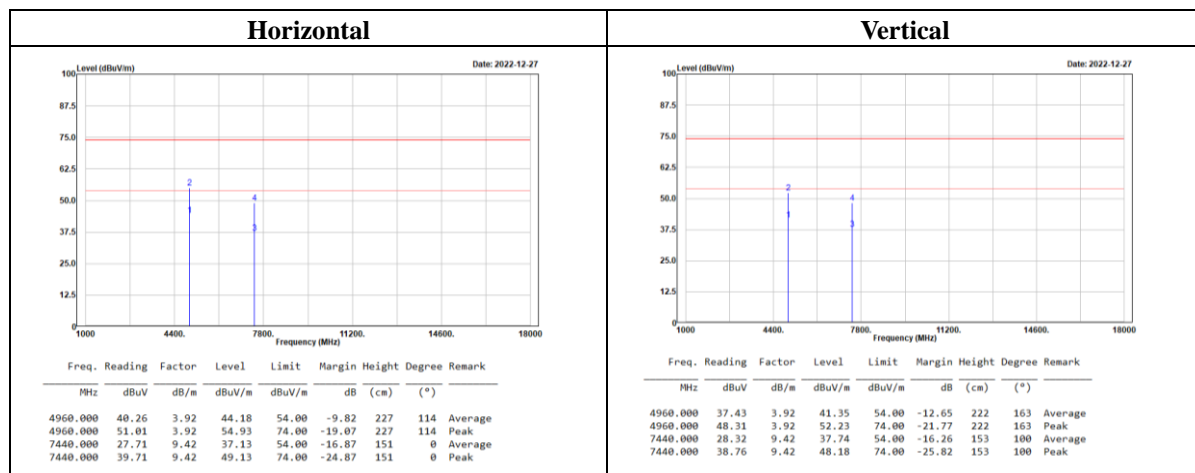
Margin = Level - Limit.

Factor = Antenna Factor + Cable Loss - Amplifier Gain.

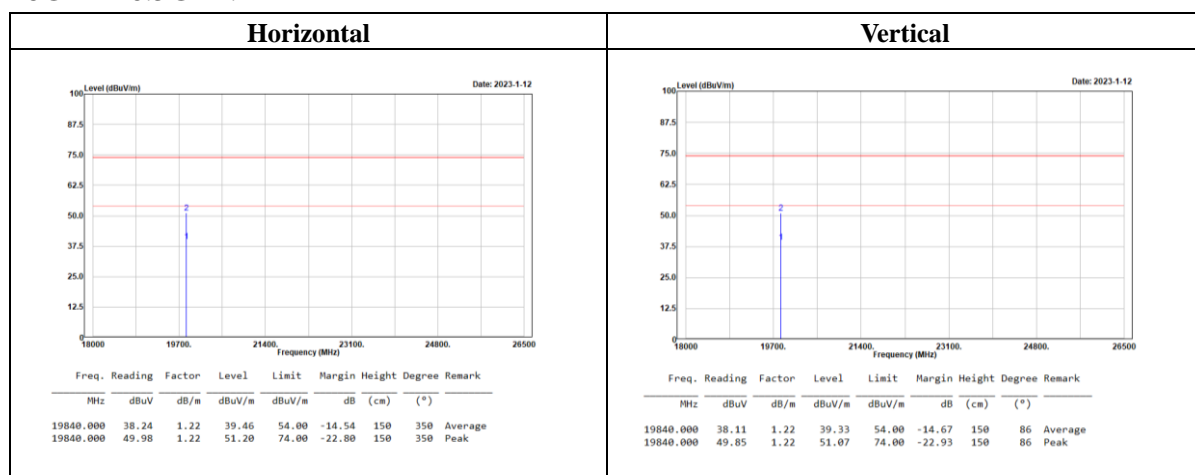
Spurious emissions more than 20 dB below the limit were not reported.

(Worst case is channel 15)

1GHz-18GHz:



18GHz-26.5GHz:



Level = Reading + Factor.

Margin = Level - Limit.

Factor = Antenna Factor + Cable Loss - Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

Above 1GHz

Channel 0								
Horizontal				Vertical				
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2388.278	47.87	-4.60	43.27	54.00	-10.73	162	17	Average
2388.278	69.23	-4.60	64.63	74.00	-9.37	162	17	Peak
2405.000	102.42	-4.45	97.97			162	17	Average
2405.000	105.03	-4.45	100.58			162	17	Peak
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4810.000	42.34	3.45	45.79	54.00	-8.21	101	19	Average
4810.000	52.44	3.45	55.89	74.00	-18.11	101	19	Peak
7215.000	27.69	9.09	36.78	54.00	-17.22	153	106	Average
7215.000	38.95	9.09	48.04	74.00	-25.96	153	106	Peak

Channel 7								
Horizontal				Vertical				
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2440.000	104.18	-4.20	99.98			133	15	Average
2440.000	105.97	-4.20	101.77			133	15	Peak
Freq.	Reading	Factor <td>Level</td> <td>Limit</td> <td>Margin</td> <td>Height</td> <td>Degree</td> <td>Remark</td>	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4880.000	39.58	3.57	43.15	54.00	-10.85	131	186	Average
4880.000	49.84	3.57	53.41	74.00	-20.59	131	186	Peak
7320.000	27.82	9.25	37.07	54.00	-16.93	154	105	Average
7320.000	39.01	9.25	48.26	74.00	-25.74	154	105	Peak

Channel 14								
Horizontal				Vertical				
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2475.000	96.48	-3.70	92.78			220	329	Average
2475.000	100.01	-3.70	96.31			220	329	Peak
2483.650	41.89	-3.59	38.30	54.00	-15.70	220	329	Average
2483.650	54.69	-3.59	51.10	74.00	-22.90	220	329	Peak
Freq.	Reading	Factor <td>Level</td> <td>Limit</td> <td>Margin</td> <td>Height</td> <td>Degree</td> <td>Remark</td>	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4950.000	41.29	5.11	46.40	54.00	-7.60	100	306	Average
4950.000	50.96	5.11	56.07	74.00	-17.93	100	306	Peak
7425.000	23.50	9.62	33.12	54.00	-20.88	104	149	Average
7425.000	37.29	9.62	46.91	74.00	-27.09	104	149	Peak

Channel 15								
Horizontal				Vertical				
Freq.	Reading	Factor	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
2480.000	94.40	-3.74	90.66			151	360	Average
2480.000	98.00	-3.74	94.26			151	360	Peak
2483.543	55.57	-3.69	51.88	54.00	-2.12	151	360	Average
2483.543	67.10	-3.69	63.41	74.00	-10.59	151	360	Peak
Freq.	Reading	Factor <td>Level</td> <td>Limit</td> <td>Margin</td> <td>Height</td> <td>Degree</td> <td>Remark</td>	Level	Limit	Margin	Height	Degree	Remark
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	(cm)	(°)	
4960.000	40.26	3.92	44.18	54.00	-9.82	227	114	Average
4960.000	51.01	3.92	54.93	74.00	-19.07	227	114	Peak
7440.000	27.71	9.42	37.13	54.00	-16.87	151	0	Average
7440.000	39.71	9.42	49.13	74.00	-24.87	151	0	Peak

Level = Reading + Factor.

Margin = Level – Limit.

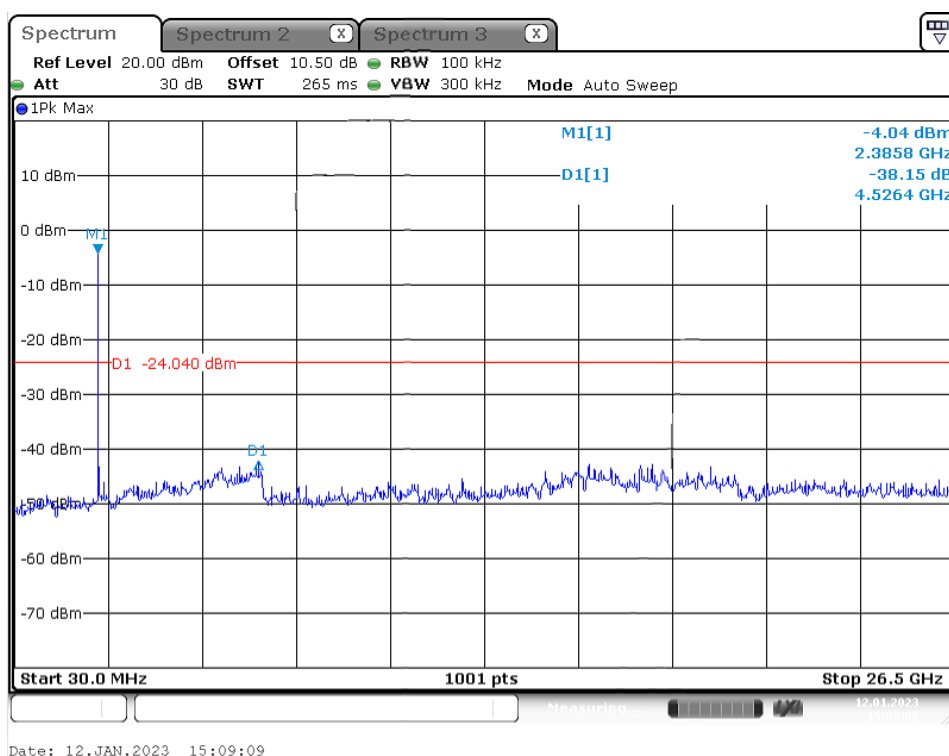
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

Spurious emissions more than 20 dB below the limit were not reported.

**Conducted Spurious Emissions:**

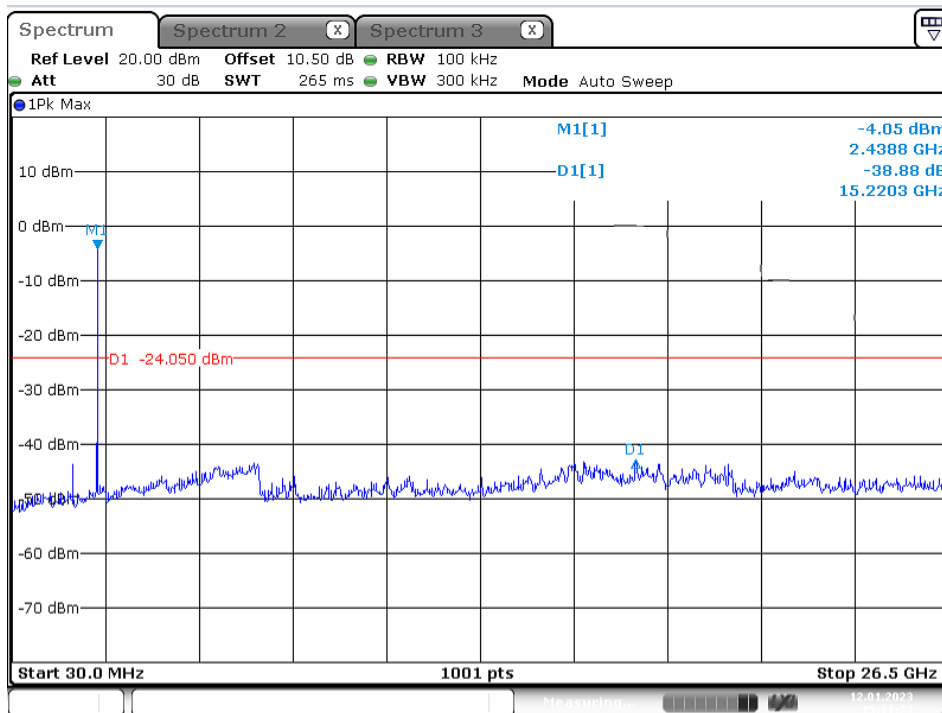
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
0	2405	38.15	≥ 20	PASS
7	2440	38.88	≥ 20	PASS
14	2475	36.51	≥ 20	PASS
15	2480	28.09	≥ 20	PASS

**Channel 0**



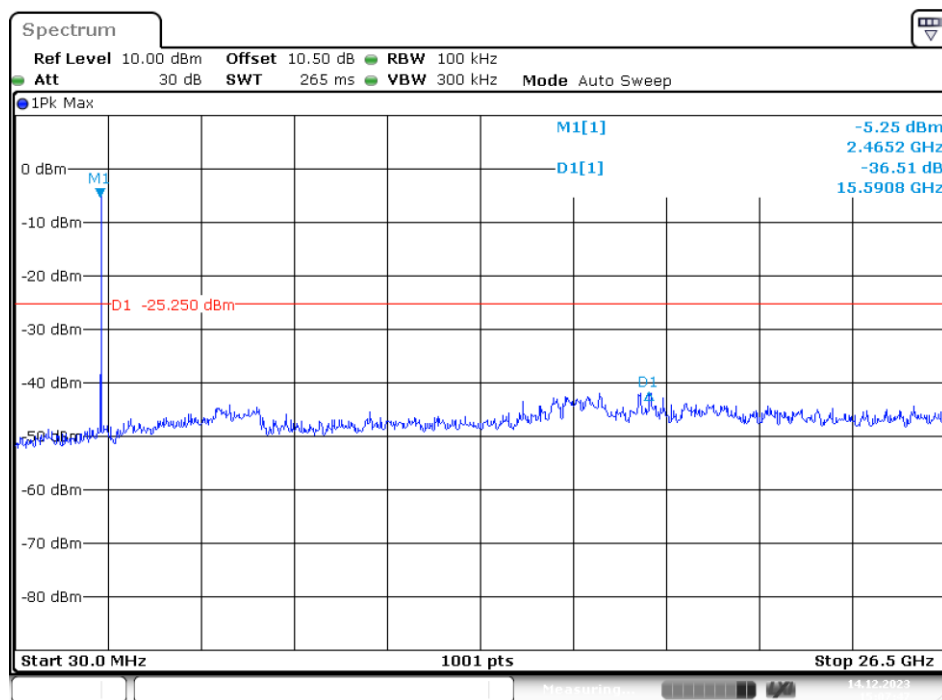


### Channel 7



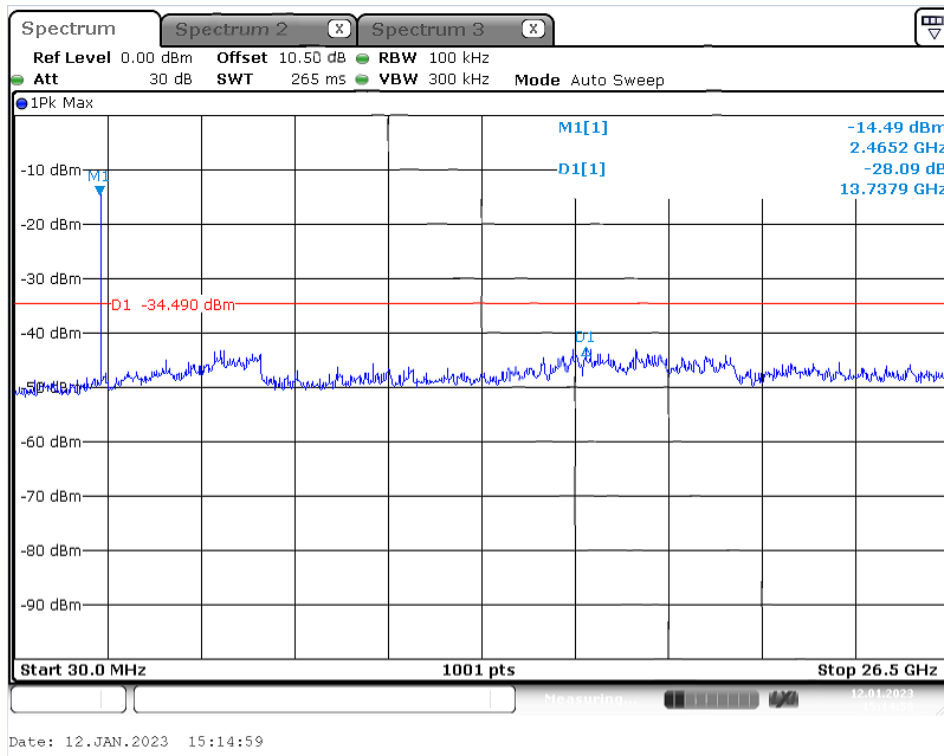
Date: 12.JAN.2023 15:11:24

### Channel 14



Date: 14.DEC.2023 15:07:48

### Channel 15



## 8 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

### 8.1 Applicable Standard

According to FCC §15.247(a)(2).

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.

### 8.2 Test Procedure

According to ANSI C63.10-2013, section 11.8

The steps for the first option are as follows:

- a) Set RBW = 100 kHz.
- b) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- c) Detector = peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) 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.

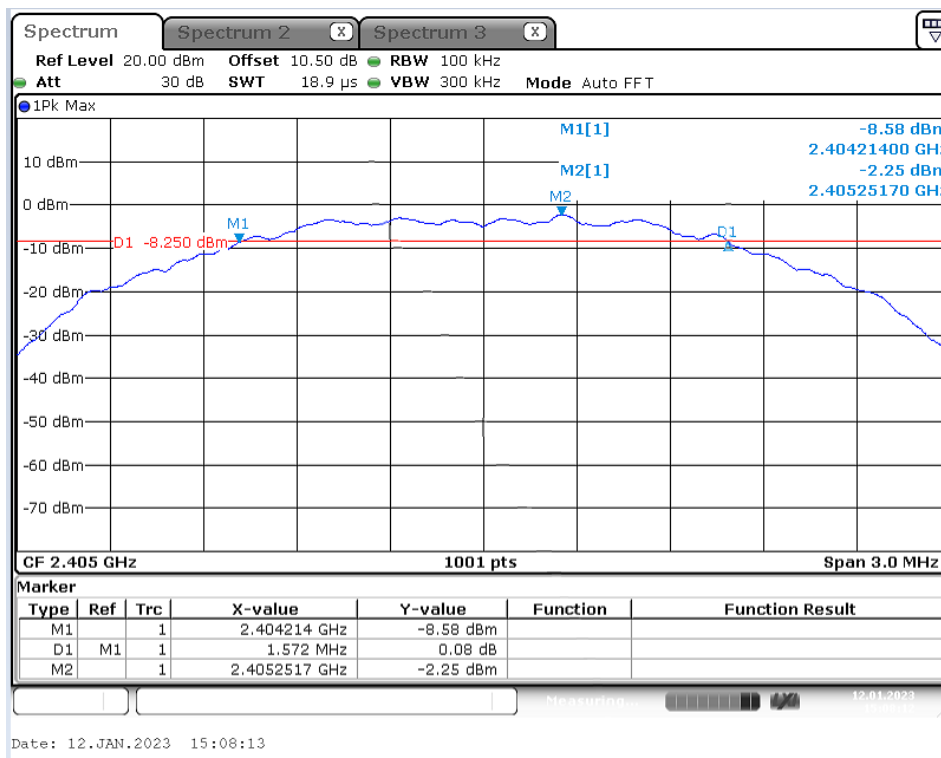
### 8.3 Test Results

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Result
0	2405	1.57	> 500	Compliance
7	2440	1.58	> 500	Compliance
14	2475	1.58	> 500	Compliance
15	2480	1.55	> 500	Compliance

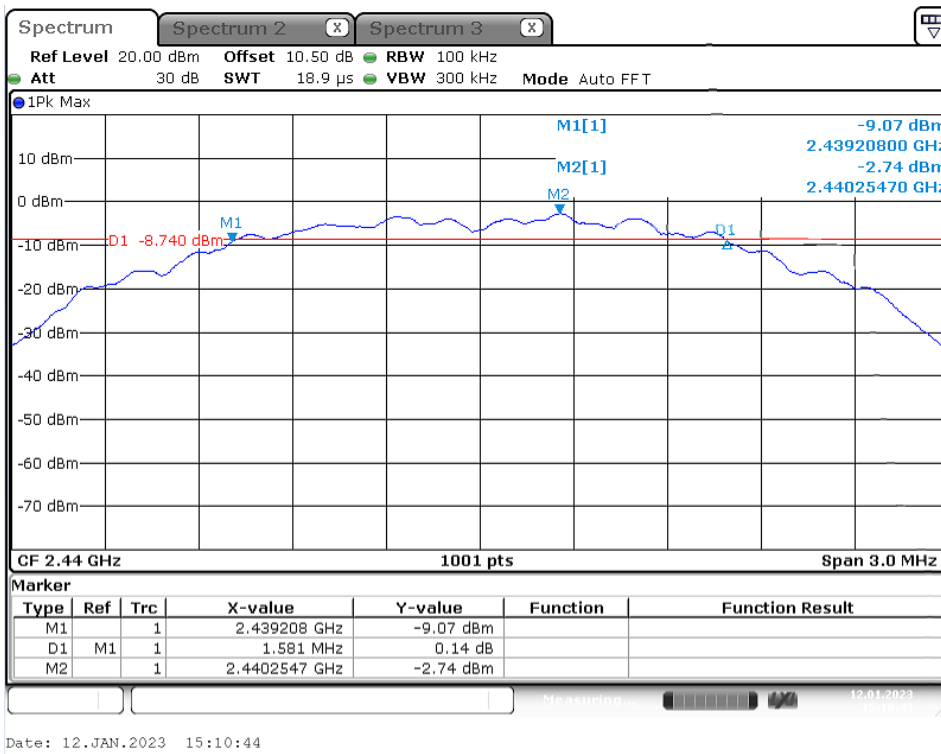
Please refer to the following plots

### 6 dB Emission Bandwidth

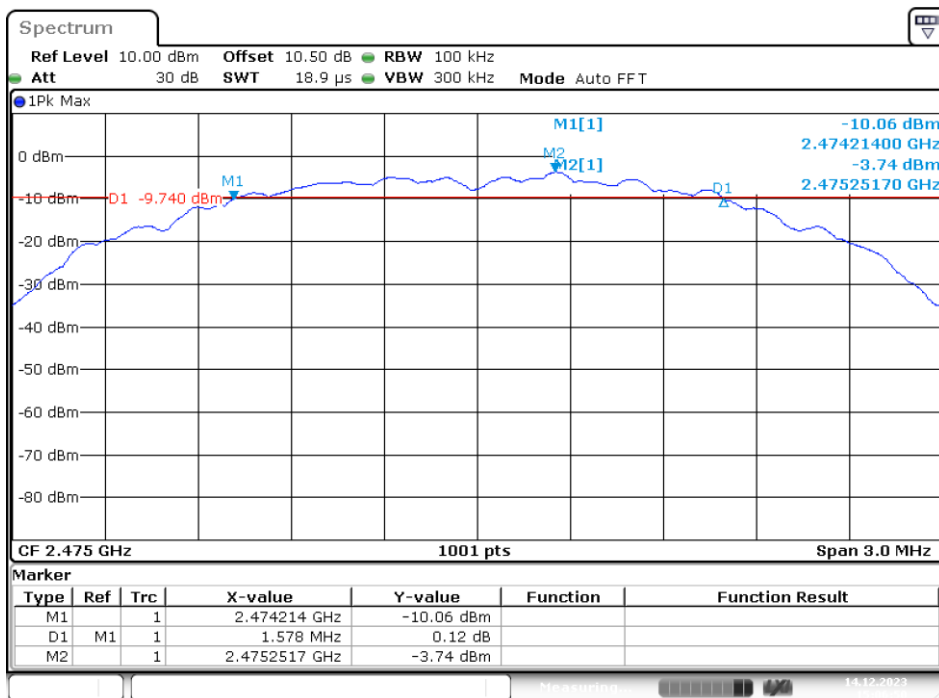
#### Channel 0



#### Channel 7

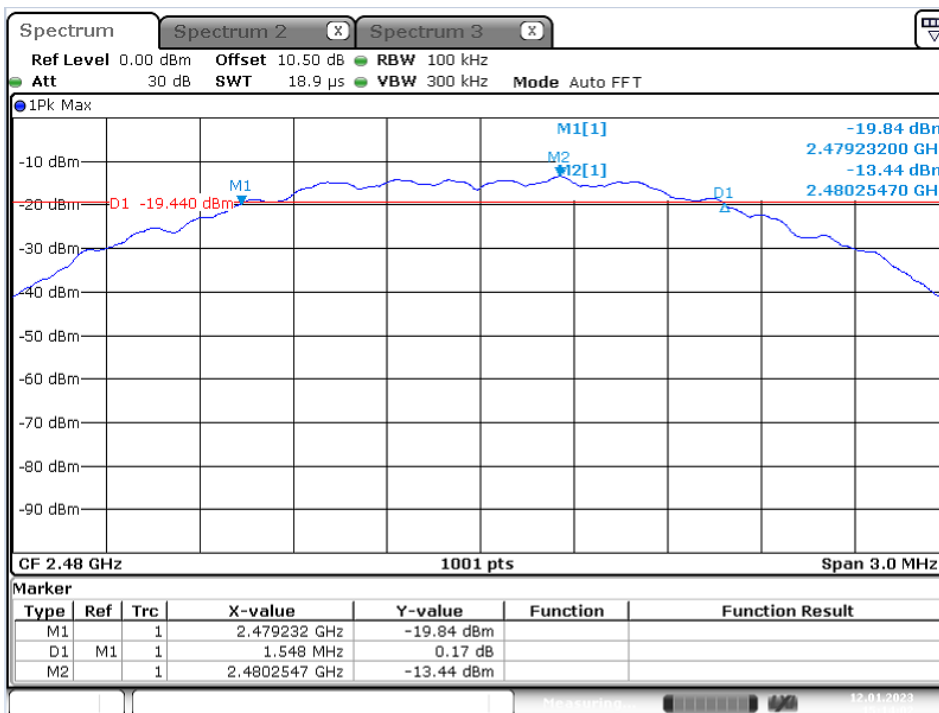


### Channel 14



Date: 14.DEC.2023 15:06:50

### Channel 15



Date: 12.JAN.2023 15:14:03

## 9 FCC §15.247(b)(3) – Maximum Output Power

### 9.1 Applicable Standard

According to FCC §15.247(b) (3).

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, compliance 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.

### 9.2 Test Procedure

According to ANSI C63.10-2013, section 11.9.1.3

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

### 9.3 Test Results

#### Conducted Peak Output Power

Channel	Frequency (MHz)	Conducted Peak Output Power (dBm)	Power (W)	Limit (W)	Result
<b>SRD Mode</b>					
0	2405	0.67	0.0012	1	PASS
7	2440	0.32	0.0011	1	PASS
14	2475	-0.63	0.0009	1	PASS
15	2480	-8.47	0.0001	1	PASS

## **10 FCC§15.247(d) – 100 kHz Bandwidth of Frequency Band Edge**

### **10.1 Applicable Standard**

According to FCC §15.247(d).

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 compliance 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)).

### **10.2 Test Procedure**

According to ANSI C63.10-2013 Section 11.11

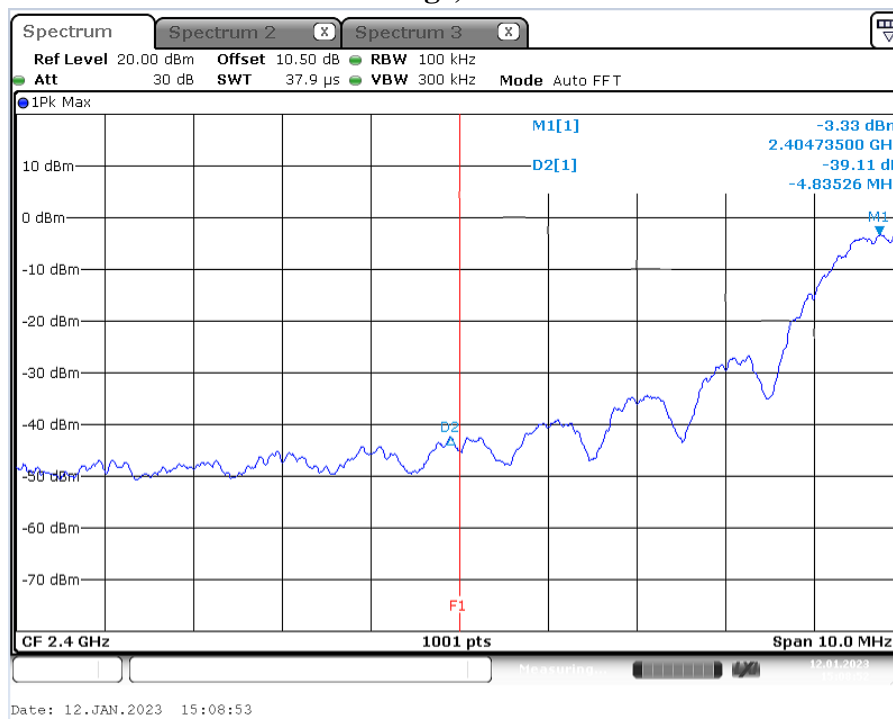
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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.

### 10.3 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
0	2405	39.11	≥ 20	PASS
14	2475	40.28	≥ 20	PASS
15	2480	32.10	≥ 20	PASS

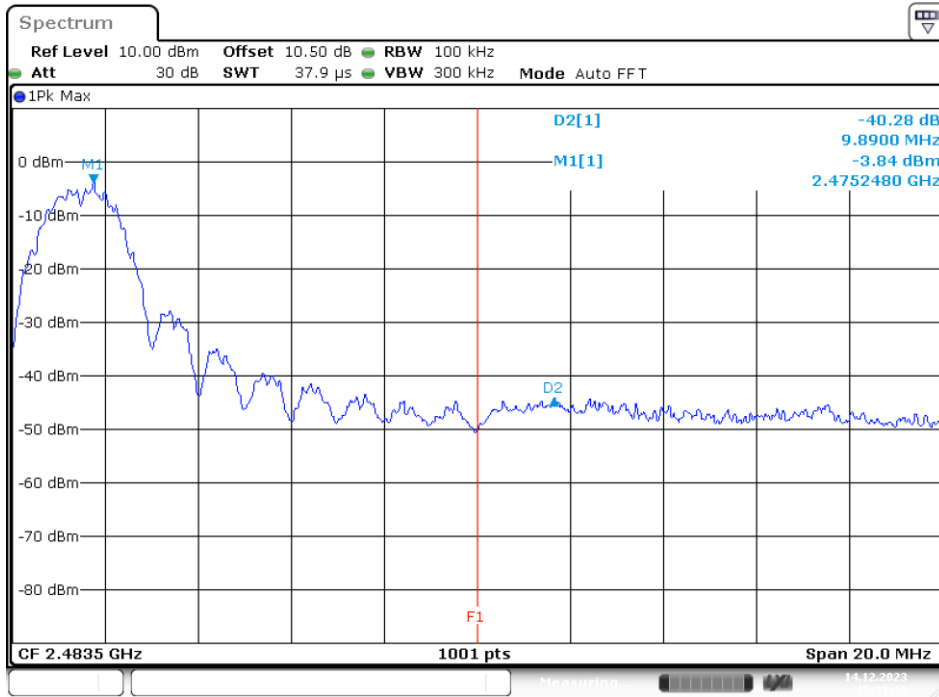
Please refer to the following plots

#### Band Edge, Channel 0

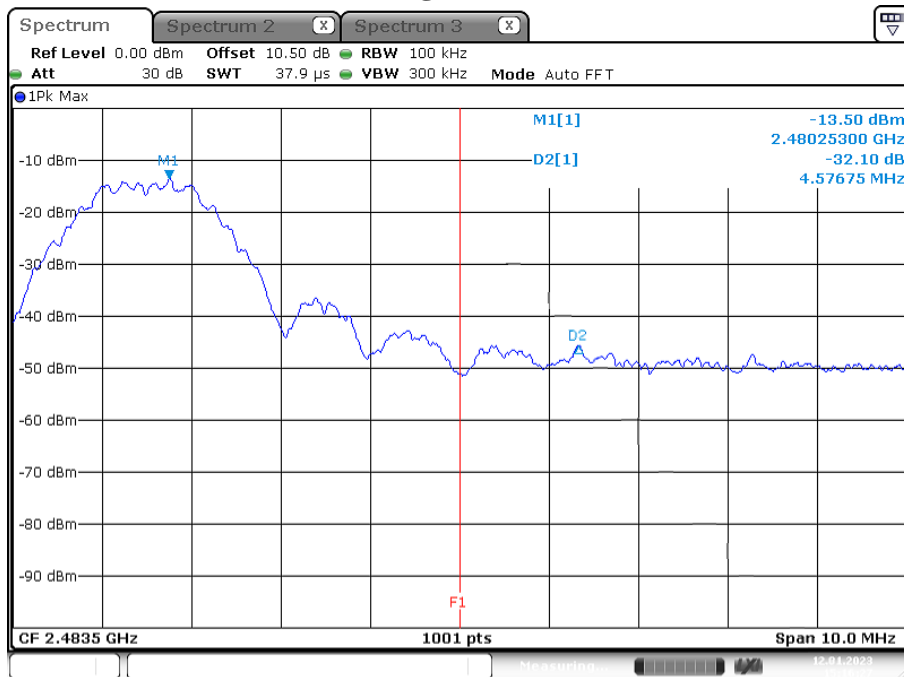




### Band Edge, Channel 14



### Band Edge, Channel 15



## 11 FCC §15.247(e) – Power Spectral Density

### 11.1 Applicable Standard

According to FCC §15.247(e).

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.

### 11.2 Test Procedure

According to ANSI C63.10-2013, section 11.10.2

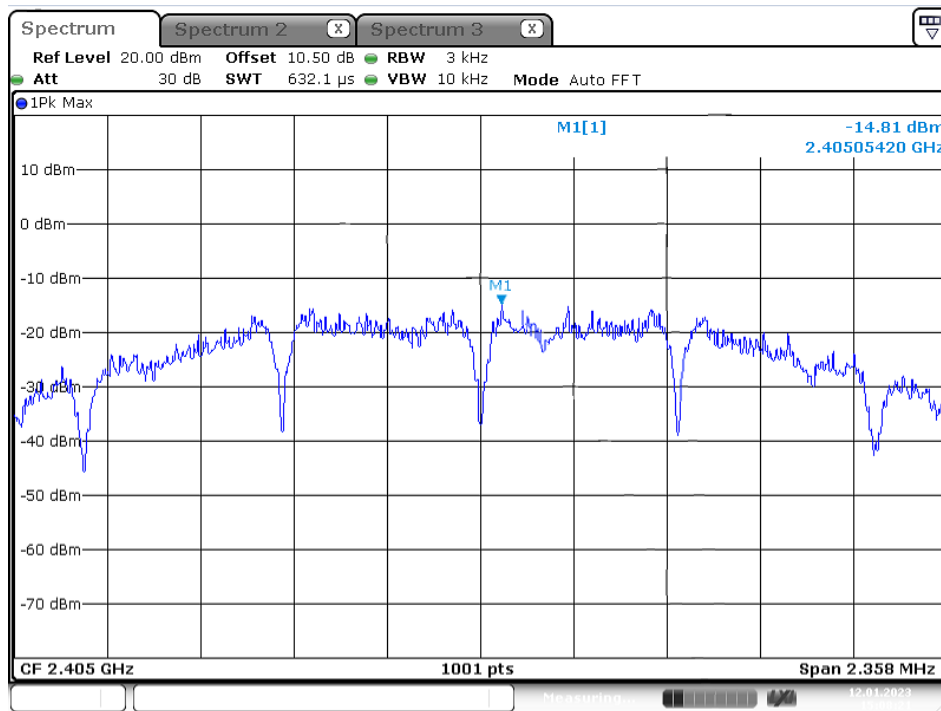
- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

### 11.3 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
0	2405	-14.81	8	Compliance
7	2440	-15.37	8	Compliance
14	2475	-16.49	8	Compliance
15	2480	-25.13	8	Compliance

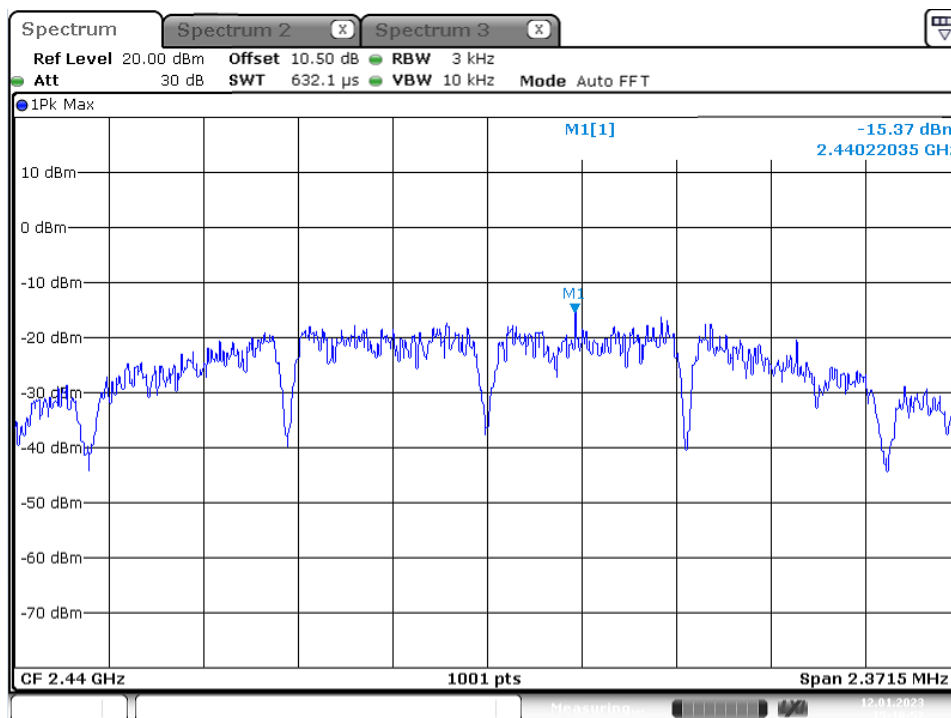
Please refer to the following plots

### Channel 0



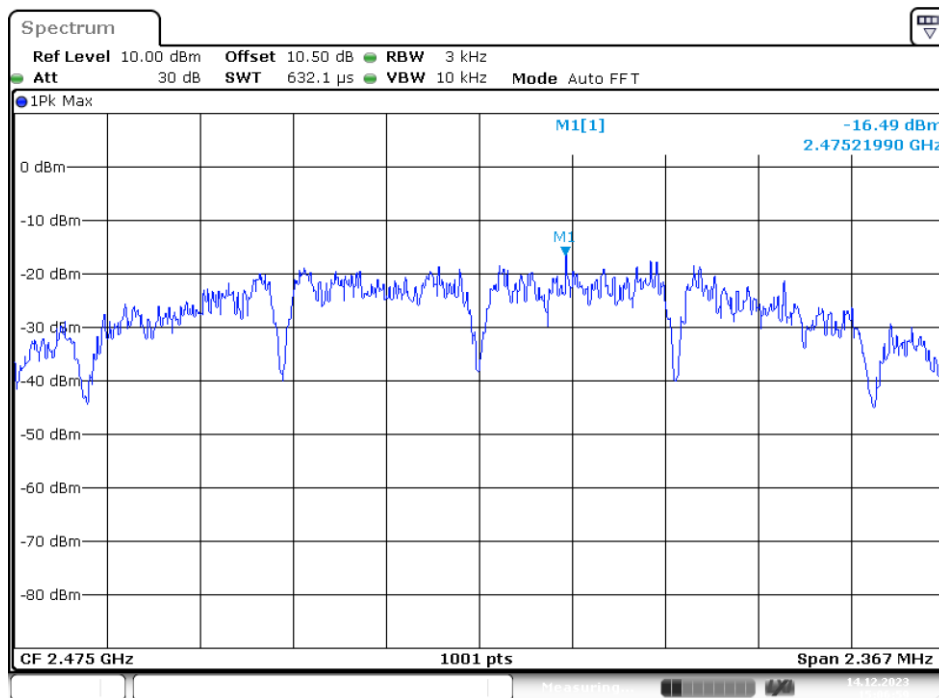
Date: 12.JAN.2023 15:08:22

### Channel 7



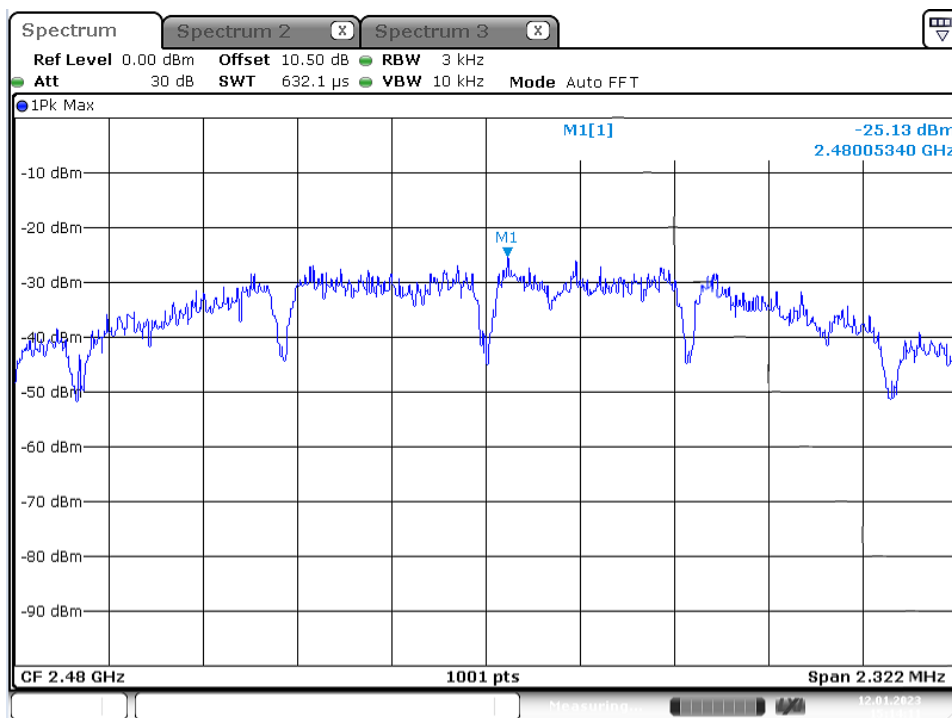
Date: 12.JAN.2023 15:10:53

### Channel 14



Date: 14.DEC.2023 15:06:59

### Channel 15



Date: 12.JAN.2023 15:14:12

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