



TESTING LABORATORY  
CERTIFICATE#4323.01



## FCC PART 15.247



### TEST REPORT

For

## FrSky Electronic Co., Ltd.

F-4, Building C, Zhongxiu Technology Park, No.3 Yuanxi Road, Wuxi, 214125, Jiangsu, China

**FCC ID: XYFTDMR2409**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Radio system
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# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

Applicant:	FrSky Electronic Co., Ltd.
Tested Model:	TD-Module
Product Type:	Radio system
Power Supply:	DC5.0V
I/O	SISO
RF Function:	SRD
Operating Band/Frequency:	904-925 MHz
Channel Number:	43
Modulation Type:	FSK
Maximum Output Power:	13.86dBm
Antenna Type:	Antenna 1: Single-band Antenna, Antenna 2: Omni Antenna
*Maximum Antenna Gain:	Antenna 1: 1.8dBi, Antenna 2: 4.0dBi

*Note\*: The maximum antenna gain was provided by the manufacturer. The EUT has two antennas that can't transmit simultaneously for 900 MHz SRD function. Two antenna ports are fully identical for 900 MHz radio based on the declaration of manufacturer, we have verified each port, the worst case emission was recorded at antenna port 2#, and the data following was presented for antenna 2#.*

*\*All measurement and test data in this report was gathered from production sample serial number: RSHD201102003-1. (Assigned by BACL, Kunshan). The EUT was received on 2020-11-02.*

## Objective

This report is prepared on behalf of *FrSky Electronic Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

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

FCC Part 15.247 DSS submissions with FCC ID: XYFTDMR2409

## 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 and FCC KDB558074 D01 DTS Meas Guidance v05r02.

All emissions measurement was performed at Bay Area Compliance 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		3.19 dB
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°C
Humidity		6%

## Test Facility

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

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and 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 for LoRa mode:

The lowest(904 MHz), middle(914.5 MHz), highest(925 MHz) channel numbers of the EUT used and tested in this report are below.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	904.00	23	915.00
2	904.50	24	915.50
3	905.00	25	916.00
4	905.50	26	916.50
5	906.00	27	917.00
6	906.50	28	917.50
7	907.00	29	918.00
8	907.50	30	918.50
9	908.00	31	919.00
10	908.50	32	919.50
11	909.00	33	920.00
12	909.50	34	920.50
13	910.00	35	921.00
14	910.50	36	921.50
15	911.00	37	922.00
16	911.50	38	922.50
17	912.00	39	923.00
18	912.50	40	923.50
19	913.00	41	924.00
20	913.50	42	924.50
21	914.00	43	925.00
22	914.50		

## Equipment Modifications

No modification was made to the EUT tested.

## EUT Exercise Software

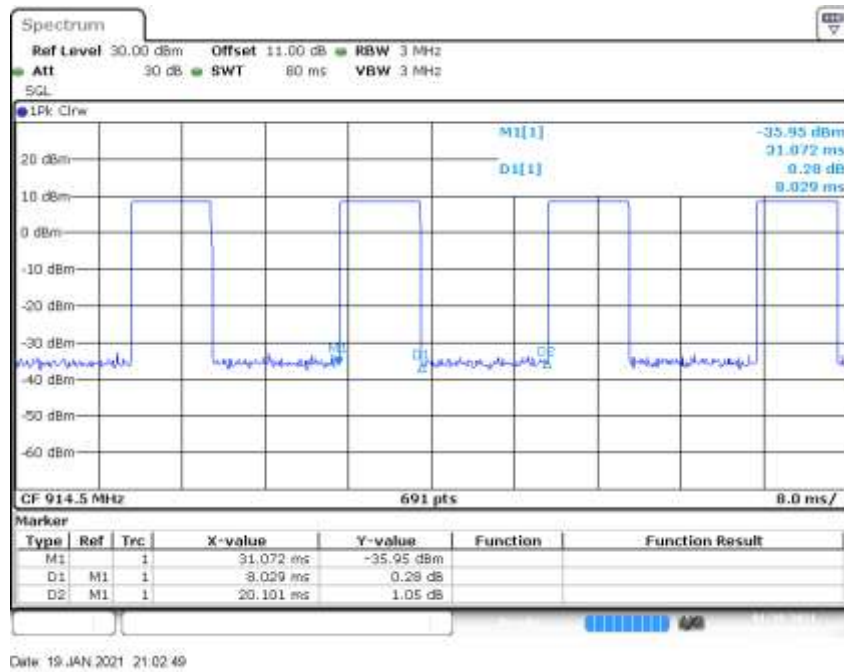
RF test tool: X20 RF system

\*Power Level: 25

Note: The power level setting was declared by the applicant.

**Duty Cycle:**

**Middle Channel**



Mode	Duty Cycle (%)	T(ms)	1/T(kHz)	10log(1/x)
LoRa	39.94	8.029	0.125	3.99

**Note:** “x” means the Duty Cycle.

### Support Equipment List and Details

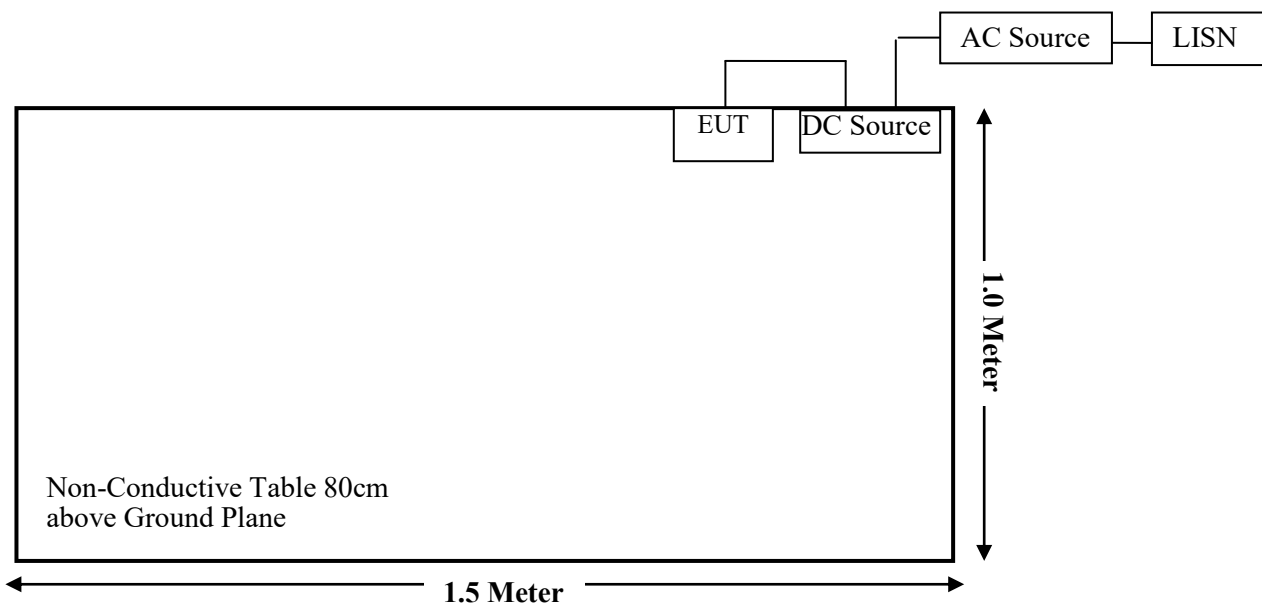
Manufacturer	Description	Model	Serial Number
ZHAOXIN	DC Source	RXN-605D	DC002

### External I/O Cable

Cable Description	Length (m)	From Port	To
Power Cable	1.0	EUT	DC Source

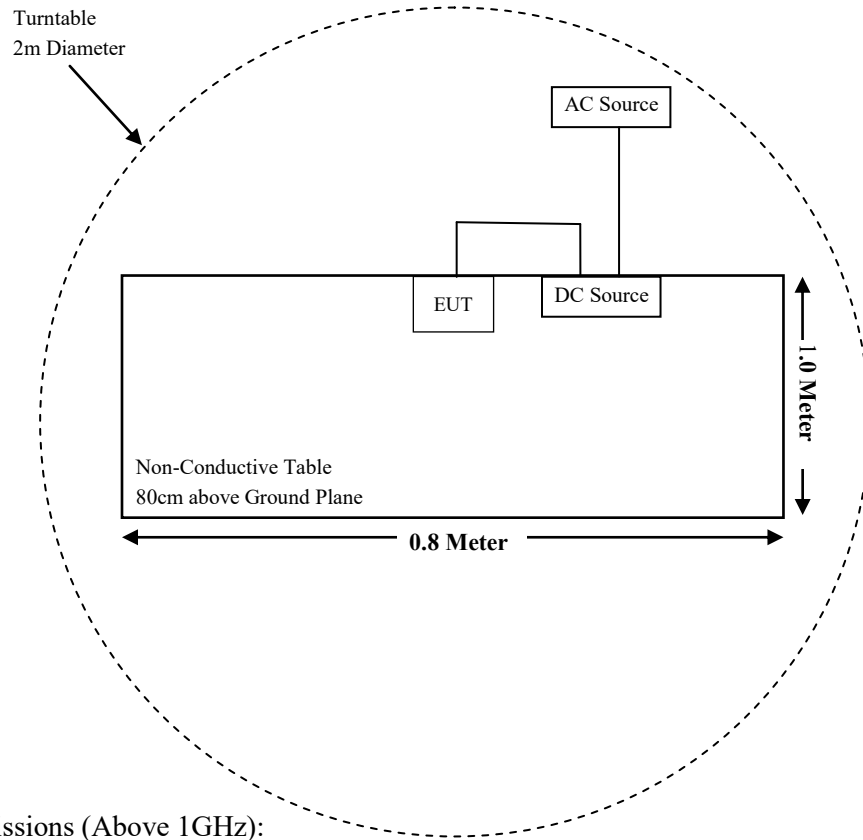
### Block Diagram of Test Setup

For Conducted Emissions:

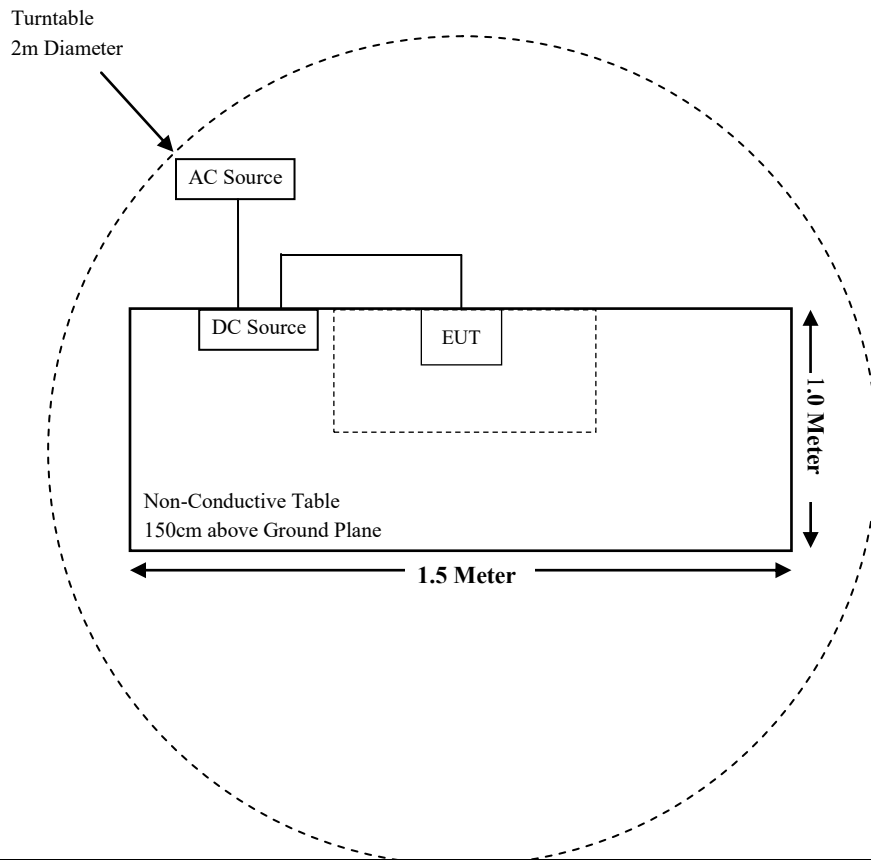




For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (I), §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	AC Line Conducted Emissions	Compliant
§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)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

# TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
<b>Radiated Emission Test (Chamber 2#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2020-08-27	2021-08-26
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2020-07-15	2023-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2019-12-12	2022-12-11
A.H.Systems, inc	Amplifier	2641-1	491	2020-02-20	2021-02-19
Narda	Attenuator	10dB	010	2020-08-15	2021-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-TRONICS	Notch Filter	BRC50722	G013	2020-08-05	2021-08-04
MICRO-COAX	Coaxial Cable	Cable-6	006	2020-08-15	2021-08-14
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
<b>Radiated Emission Test (Chamber 3#)</b>					
Rohde & Schwarz	EMI Test Receiver	ESR	102454	2020-11-27	2021-11-26
Sunol Sciences	Hybrid Antenna	JB3	A090314-1	2020-08-05	2023-08-04
Sonoma Instrument	Pre-amplifier	310N	171205	2020-08-14	2021-08-13
Audix	Test Software	e3	V9	/	/
MICRO-TRONICS	Notch Filter	BRC50722	G013	2020-08-05	2021-08-04
MICRO-COAX	Coaxial Cable	Cable-8	8	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-9	9	2020-08-15	2021-08-14
MICRO-COAX	Coaxial Cable	Cable-10	10	2020-08-15	2021-08-14
<b>RF Conducted Test</b>					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2020-11-30	2021-11-29
Rohde & Schwarz	FSV40 Signal Analyzer	FSV40	101116	2020-07-23	2021-07-22
Narda	Attenuator	2dB	002	2020-08-15	2021-08-14
FrSky Electronic Co., Ltd.	RF Cable	FrSky Electronic Co., Ltd. 01	C01	Each Time	/
<b>Conducted Emission Test</b>					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2020-11-30	2021-11-29
Rohde & Schwarz	LISN	ENV216	3560655016	2020-11-30	2021-11-29
Audix	Test Software	e3	V9	/	/
Rohde & Schwarz	Pulse limiter	ESH3-Z2	0357.8810.54	2020-08-10	2021-08-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2020-08-15	2021-08-14

\* **Statement of Traceability:** Bay Area Compliance 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 §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart 15.247 (i) and subpart 1.1310, 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300	27.5	0.073	0.2	30
300-1500	/		f/1500	30
1500-100,000	/		1.0	30

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

**Calculated Formulary:**

Predication of MPE limit at a given distance

S = PG/4πR<sup>2</sup> = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

**Calculated Data (worst case):**

Mode	Frequency Range (MHz)	Maximum Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
SRD	904-925	4.00	2.51	14.00	25.12	20	0.0125	0.60	0.0209
	2403.985-2472.985	4.00	2.51	20.00	100.00	20	0.0499	1.00	0.0499

**Note:**

- (1) The Tune-up output power was declared by the Manufacturer.
- (2) 2.4G SRD and 900MHz SRD can transmit simultaneously, the worst condition as below:

$$\sum_i \frac{S_i}{S_{Limit,j}} = 0.0209 + 0.0499 = 0.07 < 1.0$$

**Conclusion:** The EUT meets exemption requirement- RF exposure evaluation greater than 20cm distance specified in § 2.1091. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

# 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 compliance 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 two antennas for 900MHz SRD. Antenna use a unique type of connector to attach to the EUT.

Function	Manufacturer	Antenna No.	Antenna Type	Model number	Max. Antenna Gain
900MHz SRD	Angeei	1	Single-band	P081002-195B13U1S	1.8
	Feiyuxin	2	Omni	<i>3.10.0405001589</i>	4.0

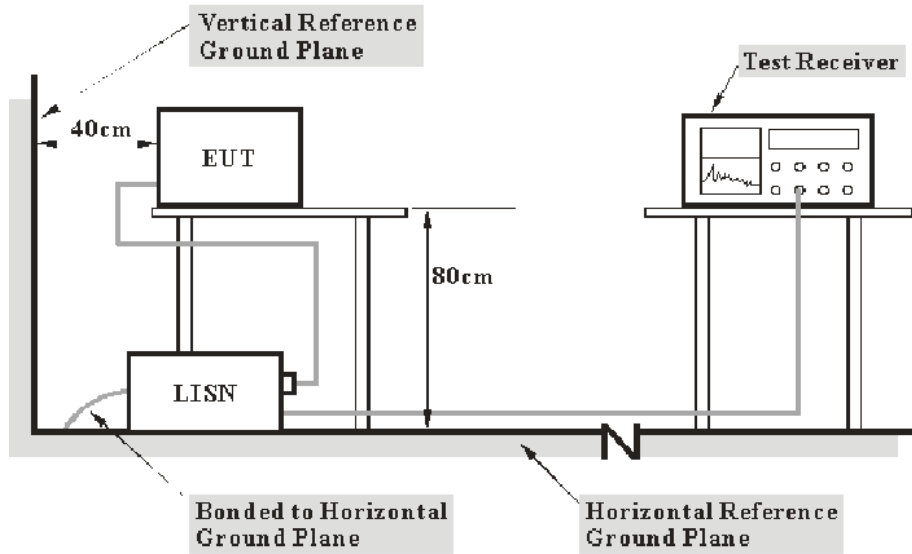
**Result:** Compliant.

# FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

## Applicable Standard

FCC§15.207

## EUT Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

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

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

## Test Procedure

During the conducted emission test, the DC Source was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Corrected Factor (dB)} = \text{LISN VDF (dB)} + \text{Cable Loss (dB)} + \text{Transient Limiter Attenuation (dB)}$$

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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V)} - \text{Corrected Amplitude (dB}\mu\text{V)}$$

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25.3 °C
<b>Relative Humidity:</b>	54 %
<b>ATM Pressure:</b>	101.1 kPa

*The testing was performed by Tyrone Wang on 2021-01-21.*

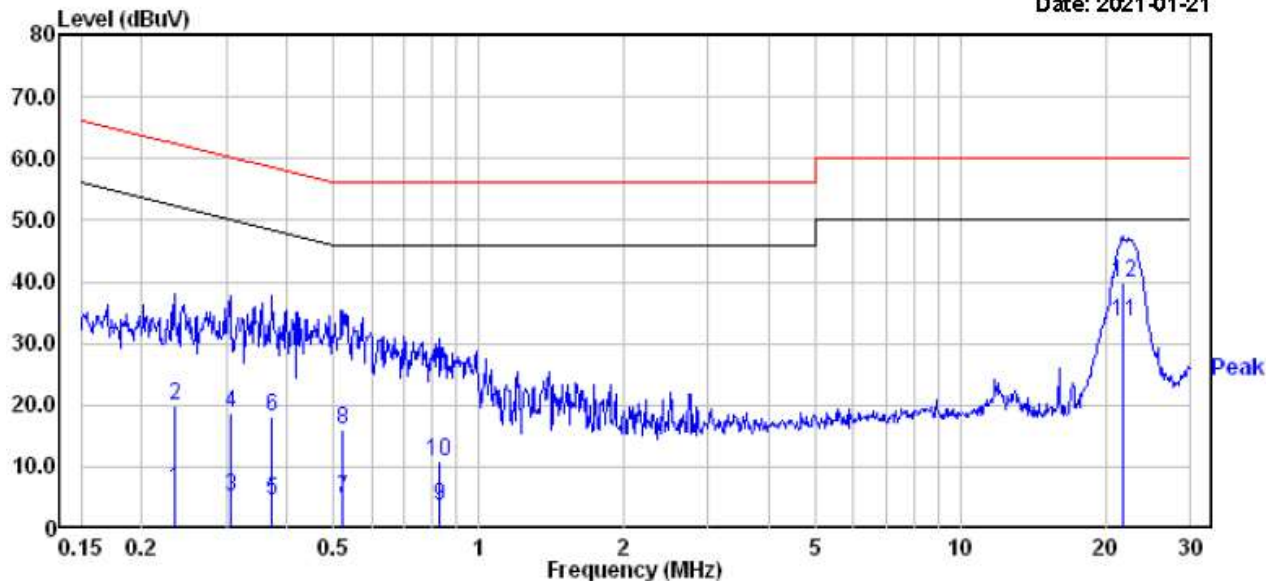
*EUT operation mode: Transmitting in middle channel by Antenna 2 (worst case)*

*Note: We only select Antenna 2 tested for the conducted emissions since the Antenna2's gain is greater than other antennas.*



AC 120V/60 Hz, Line

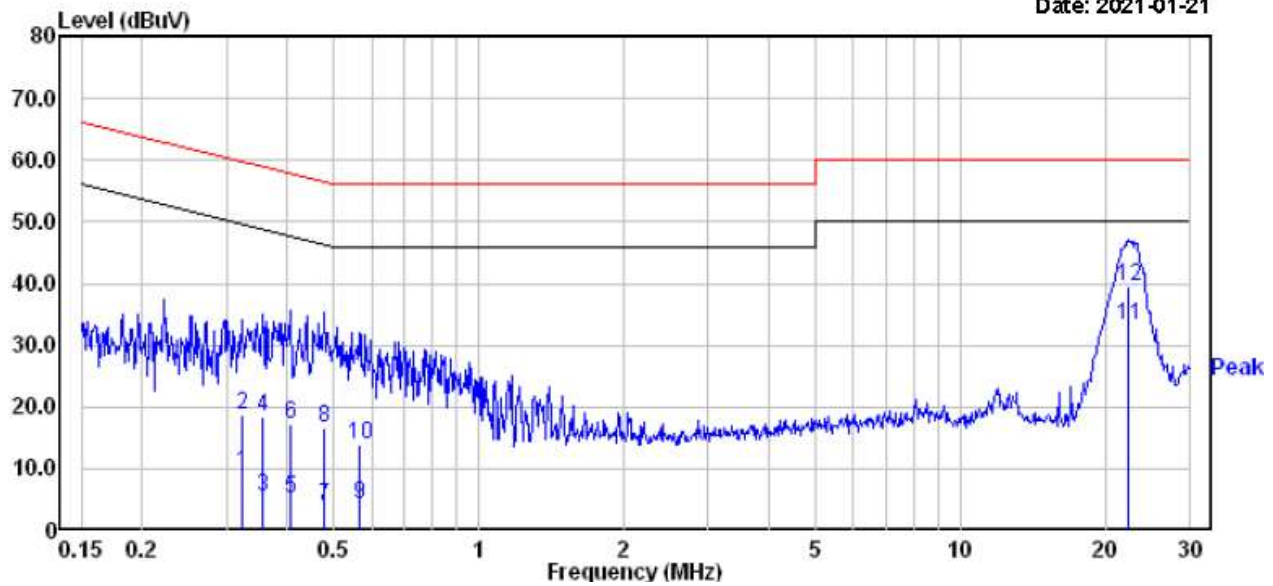
Date: 2021-01-21



	Read Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.234	-13.60	19.82	6.22	52.30	-46.08	Average
2	0.234	0.20	19.82	20.02	62.30	-42.28	QP
3	0.305	-14.81	19.83	5.02	50.10	-45.08	Average
4	0.305	-1.11	19.83	18.72	60.10	-41.38	QP
5	0.373	-15.11	19.78	4.67	48.43	-43.76	Average
6	0.373	-1.61	19.78	18.17	58.43	-40.26	QP
7	0.521	-15.00	19.76	4.76	46.00	-41.24	Average
8	0.521	-3.80	19.76	15.96	56.00	-40.04	QP
9	0.826	-16.10	19.71	3.61	46.00	-42.39	Average
10	0.826	-8.80	19.71	10.91	56.00	-45.09	QP
11	21.715	13.70	19.86	33.56	50.00	-16.44	Average
12	21.715	20.00	19.86	39.86	60.00	-20.14	QP

AC 120V/60 Hz, Neutral

Date: 2021-01-21



	Read Freq	Read Level	Read Factor	Limit Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.322	-10.40	19.82	9.42	49.66	-40.24	Average
2	0.322	-1.00	19.82	18.82	59.66	-40.84	QP
3	0.356	-14.30	19.80	5.50	48.83	-43.33	Average
4	0.356	-1.40	19.80	18.40	58.83	-40.43	QP
5	0.408	-14.60	19.74	5.14	47.68	-42.54	Average
6	0.408	-2.50	19.74	17.24	57.68	-40.44	QP
7	0.479	-15.90	19.76	3.86	46.36	-42.50	Average
8	0.479	-3.30	19.76	16.46	56.36	-39.90	QP
9	0.567	-15.60	19.75	4.15	46.00	-41.85	Average
10	0.567	-6.00	19.75	13.75	56.00	-42.25	QP
11	22.298	13.30	19.83	33.13	50.00	-16.87	Average
12	22.298	19.70	19.83	39.53	60.00	-20.47	QP

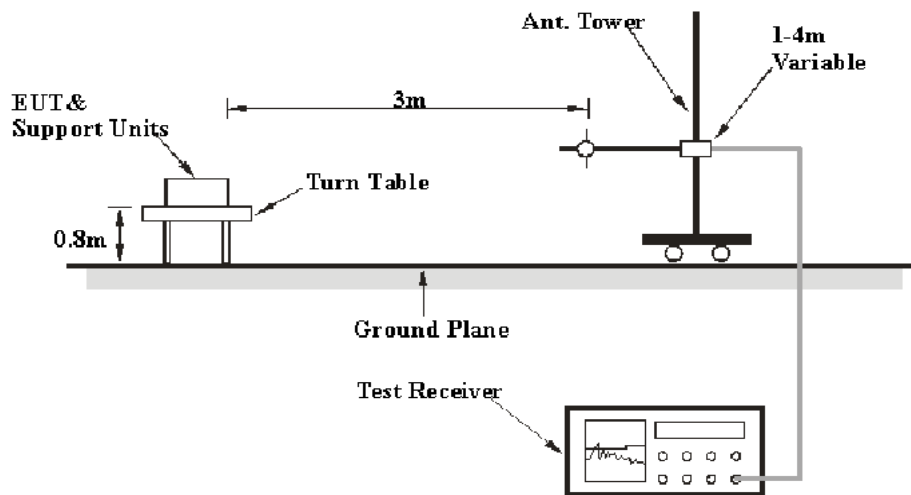
# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## Applicable Standard

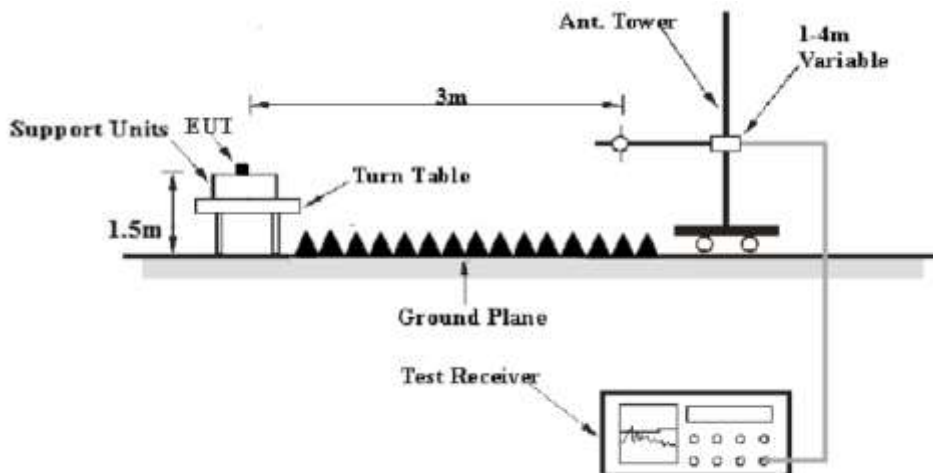
FCC §15.247 (d); §15.209; §15.205;

## 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 10 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	/	Ave

## 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 modes 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:

$$\text{Corrected Amplitude (dB}\mu\text{V /m)} = \text{Meter Reading (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amplifier Gain (dB)}$$

The “**Margin**” column of the following data tables indicates the degree of compliance 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:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V/m)} - \text{Corrected Amplitude (dB}\mu\text{V /m)}$$

## Test Results Summary

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

# Test Data

## Environmental Conditions

<b>Temperature:</b>	23.4-25.2°C
<b>Relative Humidity:</b>	47-53 %
<b>ATM Pressure:</b>	101.2-103.2 kPa

The testing was performed by Tyrone Wang from 2020-12-21 to 2020-12-28.

EUT operation mode: Transmitting

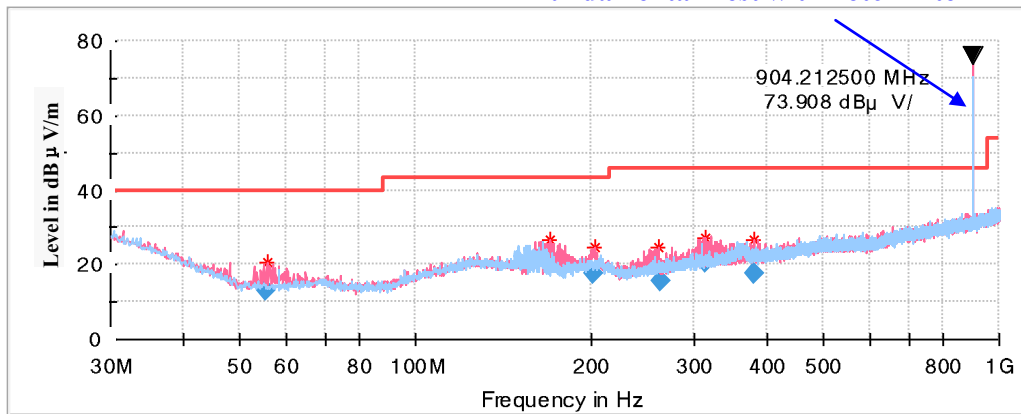
For antenna 1:

### Spurious Emission Test:

#### 30MHz-1GHz:

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

**Fundamental Test with notch filter**



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)				
55.559150	13.07	100.0	V	192.0	-18.0	40.00	26.93
170.591200	21.42	100.0	V	131.0	-13.2	43.50	22.08
202.124400	17.50	100.0	V	168.0	-11.7	43.50	26.00
262.415150	15.74	100.0	V	256.0	-12.6	46.00	30.26
314.398850	20.54	200.0	V	217.0	-10.7	46.00	25.46
379.135050	17.40	100.0	V	76.0	-9.1	46.00	28.60

**1GHz-18GHz**

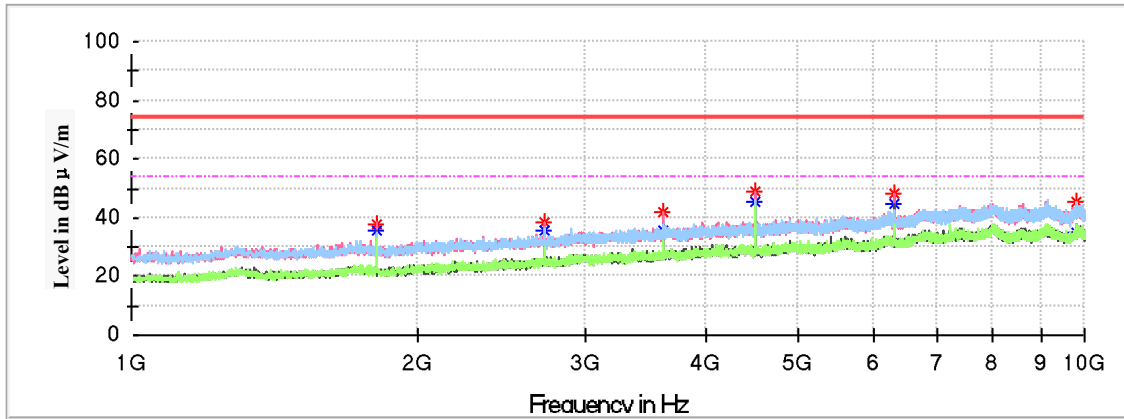
(Pre-scan in the X,Y and Z axes of orientation, the worst case X-axis of orientation was recorded.)

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)

**Low Channel: 904MHz**

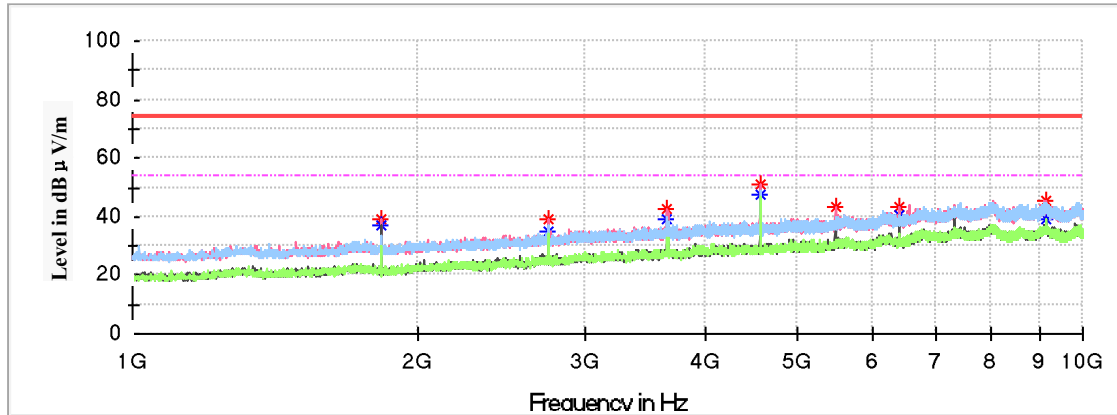
Full Spectrum



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)				
1808.000000	---	35.74	150.0	V	325.0	-15.2	54.00	18.26
1808.000000	38.09	---	150.0	V	325.0	-15.2	74.00	35.91
2712.000000	---	35.46	200.0	V	151.0	-11.4	54.00	18.54
2712.000000	38.15	---	200.0	V	151.0	-11.4	74.00	35.85
3617.200000	---	35.99	200.0	V	339.0	-8.4	54.00	18.01
3617.200000	41.64	---	200.0	V	339.0	-8.4	74.00	32.36
4520.800000	---	45.30	200.0	V	38.0	-6.2	54.00	8.70
4520.800000	48.77	---	200.0	V	38.0	-6.2	74.00	25.23
6328.900000	---	44.50	150.0	V	325.0	-1.8	54.00	9.50
6328.900000	48.39	---	150.0	V	325.0	-1.8	74.00	25.61
9804.700000	---	34.88	200.0	H	214.0	2.0	54.00	19.12
9804.700000	45.53	---	200.0	H	214.0	2.0	74.00	28.47

**Middle Channel: 914.5MHz**

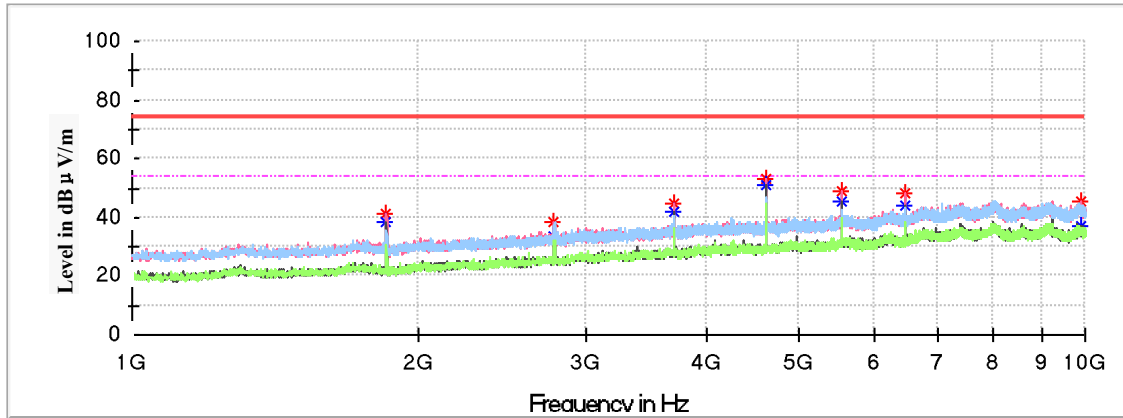
Full Spectrum



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)				
1829.000000	---	36.72	150.0	V	49.0	-15.1	54.00	17.28
1829.000000	38.90	---	150.0	V	49.0	-15.1	74.00	35.10
2743.500000	---	34.81	150.0	V	141.0	-11.3	54.00	19.19
2743.500000	39.23	---	150.0	V	141.0	-11.3	74.00	34.77
3657.700000	---	39.39	200.0	V	290.0	-8.2	54.00	14.61
3657.700000	42.39	---	200.0	V	290.0	-8.2	74.00	31.61
4572.100000	---	47.55	150.0	V	320.0	-6.1	54.00	6.45
4572.100000	50.76	---	150.0	V	320.0	-6.1	74.00	23.24
5486.500000	---	36.77	200.0	V	35.0	-3.9	54.00	17.23
5486.500000	43.34	---	200.0	V	35.0	-3.9	74.00	30.66
6402.700000	---	40.60	200.0	V	334.0	-1.5	54.00	13.40
6402.700000	43.64	---	200.0	V	334.0	-1.5	74.00	30.36
9146.800000	---	39.48	150.0	V	172.0	2.0	54.00	14.52
9146.800000	45.24	---	150.0	V	172.0	2.0	74.00	28.76

### High Channel: 925MHz

Full Spectrum



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)				
1850.000000	---	38.64	200.0	V	63.0	-15.0	54.00	15.36
1850.000000	41.10	---	200.0	V	63.0	-15.0	74.00	32.90
2775.000000	---	33.82	200.0	V	176.0	-11.1	54.00	20.18
2775.000000	38.12	---	200.0	V	176.0	-11.1	74.00	35.88
3700.000000	---	42.20	150.0	V	251.0	-8.1	54.00	11.80
3700.000000	44.67	---	150.0	V	251.0	-8.1	74.00	29.33
4625.200000	---	51.22	150.0	V	0.0	-6.0	54.00	2.78
4625.200000	53.20	---	150.0	V	0.0	-6.0	74.00	20.80
5550.400000	---	45.42	200.0	V	48.0	-3.8	54.00	8.58
5550.400000	49.09	---	200.0	V	48.0	-3.8	74.00	24.91
6474.700000	---	43.85	200.0	V	207.0	-1.3	54.00	10.15
6474.700000	48.06	---	200.0	V	207.0	-1.3	74.00	25.94
9907.300000	45.48	---	150.0	V	349.0	2.0	74.00	28.52
9907.300000	---	36.80	150.0	V	349.0	2.0	54.00	17.20

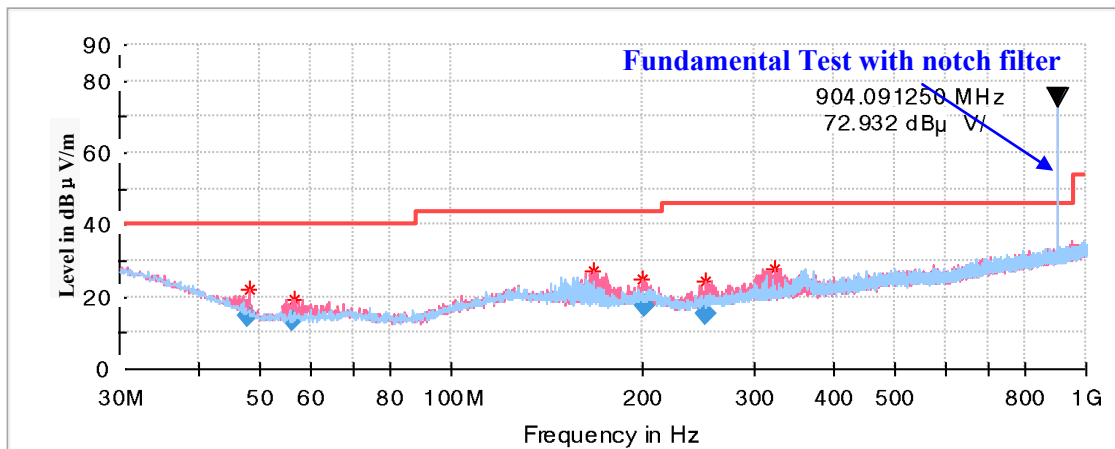


For antenna 2:

**Spurious Emission Test:**

**30MHz-1GHz**

(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 X-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)				
47.811300	14.81	200.0	V	154.0	-15.8	40.00	25.19
56.351950	13.81	100.0	V	114.0	-18.0	40.00	26.19
167.291900	21.25	100.0	V	163.0	-13.1	43.50	22.25
200.977600	17.64	100.0	V	279.0	-11.6	43.50	25.86
251.121800	15.10	100.0	V	28.0	-13.1	46.00	30.90
322.211000	22.85	200.0	V	178.0	-10.5	46.00	23.15

**1GHz-18GHz**

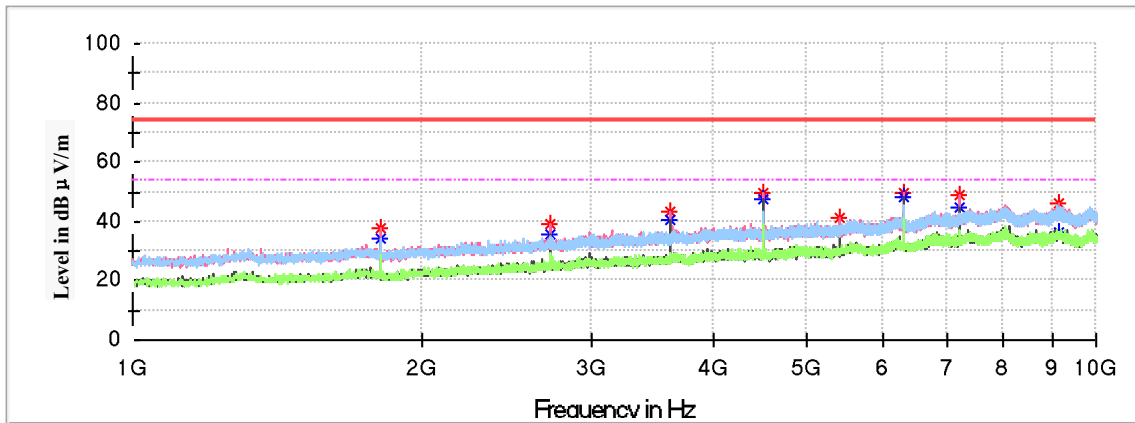
Pre-scan in the X,Y and Z axes of orientation, the worst case **X-axis of orientation** was recorded.

Note:

1. The test was performed with a 10dB Attenuator.
2. Corrected Factor (dB/m) = Antenna factor (RX) (dB/m) + Cable Loss (dB) – Amplifier Factor (dB) + Attenuator(dB)  
 Corrected Amplitude (dBµV /m) = Corrected Factor (dB/m) + Reading (dBµV)  
 Margin (dB) = Limit (dBµV/m) – Corrected Amplitude (dBµV /m)

**Low Channel: 904.0MHz**

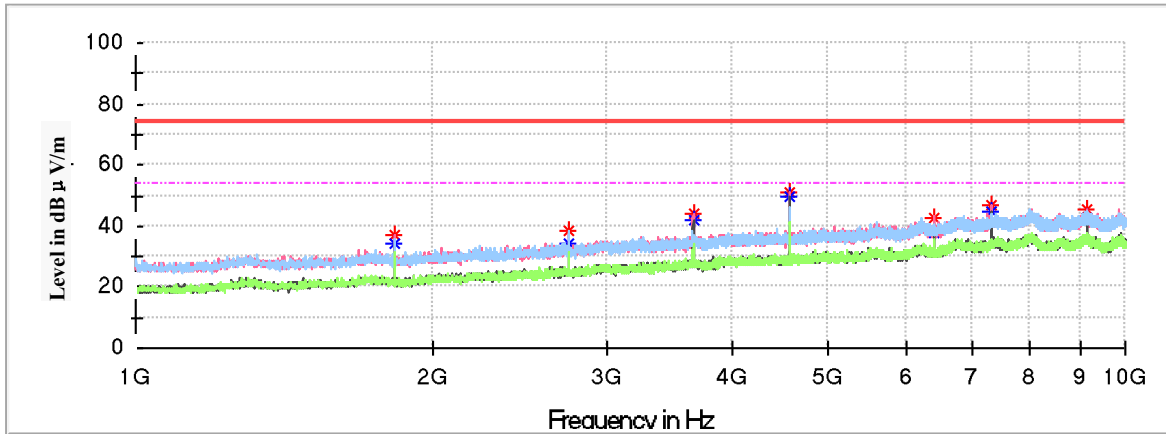
Full Spectrum



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)				
1808.000000	---	34.55	200.0	V	345.0	-15.2	54.00	19.45
1808.000000	37.73	---	200.0	V	345.0	-15.2	74.00	36.27
2712.000000	---	35.50	150.0	V	186.0	-11.4	54.00	18.50
2712.000000	38.81	---	150.0	V	186.0	-11.4	74.00	35.19
3616.300000	---	40.55	150.0	V	246.0	-8.4	54.00	13.45
3616.300000	43.42	---	150.0	V	246.0	-8.4	74.00	30.58
4519.900000	49.63	---	200.0	V	48.0	-6.2	74.00	24.37
4519.900000	---	47.45	200.0	V	48.0	-6.2	54.00	6.55
5424.400000	---	36.90	150.0	V	35.0	-4.1	54.00	17.10
5424.400000	41.43	---	150.0	V	35.0	-4.1	74.00	32.57
6327.100000	49.43	---	200.0	V	334.0	-1.8	74.00	24.57
6327.100000	---	47.91	200.0	V	334.0	-1.8	54.00	6.09
7231.600000	---	44.85	150.0	V	186.0	0.4	54.00	9.15
7231.600000	48.92	---	150.0	V	186.0	0.4	74.00	25.08
9128.800000	---	36.15	150.0	V	216.0	1.9	54.00	17.85
9128.800000	46.15	---	150.0	V	216.0	1.9	74.00	27.85

**Middle Channel: 914.5MHz**

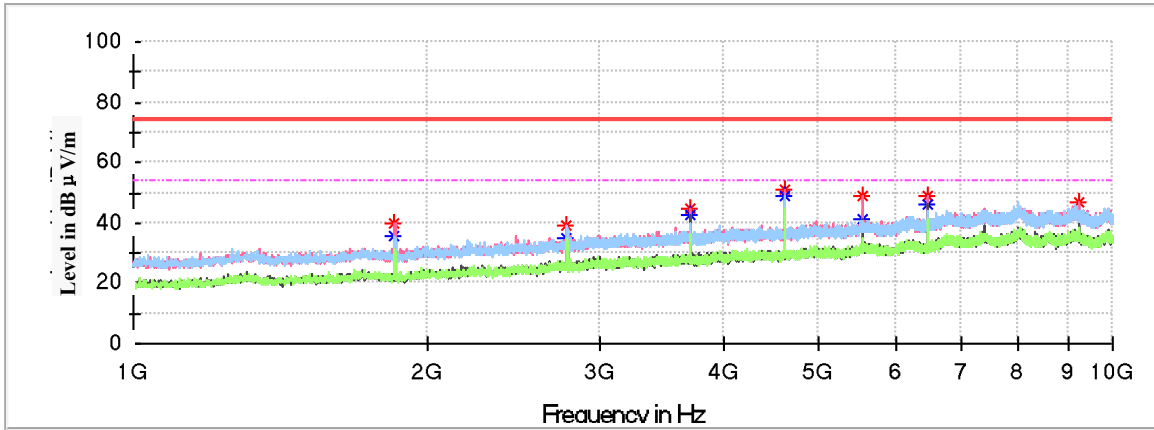
Full Spectrum



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)				
1829.000000	---	34.47	200.0	V	323.0	-15.1	54.00	19.53
1829.000000	36.95	---	200.0	V	323.0	-15.1	74.00	37.05
2743.500000	---	34.47	200.0	H	142.0	-11.3	54.00	19.53
2743.500000	38.45	---	200.0	H	142.0	-11.3	74.00	35.55
3658.600000	---	42.04	150.0	V	264.0	-8.2	54.00	11.96
3658.600000	44.03	---	150.0	V	264.0	-8.2	74.00	29.97
4573.000000	---	49.77	150.0	V	248.0	-6.1	54.00	4.23
4573.000000	51.30	---	150.0	V	248.0	-6.1	74.00	22.70
6401.800000	---	38.11	200.0	V	323.0	-1.5	54.00	15.89
6401.800000	42.71	---	200.0	V	323.0	-1.5	74.00	31.29
7315.300000	---	44.87	150.0	V	187.0	0.6	54.00	9.13
7315.300000	47.20	---	150.0	V	187.0	0.6	74.00	26.80
9146.800000	---	42.74	150.0	V	172.0	2.0	54.00	11.26
9146.800000	45.40	---	150.0	V	172.0	2.0	74.00	28.60

**High Channel: 925MHz**

Full Spectrum



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)				
1850.000000	40.11	---	150.0	V	54.0	-15.0	74.00	33.89
1850.000000	---	35.51	150.0	V	54.0	-15.0	54.00	18.49
2775.000000	---	35.09	200.0	H	108.0	-11.1	54.00	18.91
2775.000000	39.33	---	200.0	H	108.0	-11.1	74.00	34.67
3700.000000	---	42.77	200.0	V	281.0	-8.1	54.00	11.23
3700.000000	45.09	---	200.0	V	281.0	-8.1	74.00	28.91
4625.200000	---	49.06	200.0	V	35.0	-6.0	54.00	4.94
4626.100000	51.35	---	200.0	V	35.0	-6.0	74.00	22.65
5549.500000	---	41.24	200.0	V	192.0	-3.8	54.00	12.76
5549.500000	49.25	---	200.0	V	192.0	-3.8	74.00	24.75
6474.700000	---	46.36	150.0	V	0.0	-1.3	54.00	7.64
6474.700000	49.12	---	150.0	V	0.0	-1.3	74.00	24.88
9253.000000	---	42.41	150.0	V	131.0	2.0	54.00	11.59
9253.000000	46.78	---	150.0	V	131.0	2.0	74.00	27.22

**Fundamental Test & Restricted Bands Emissions Test:**

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

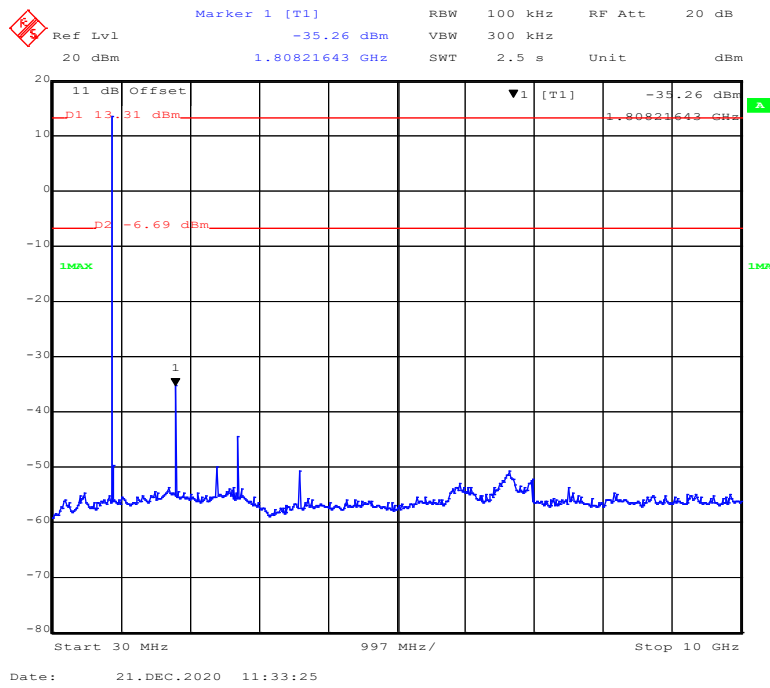
Note:

1. The test is performed with a 10dB Attenuator.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor  
 Corrected Amplitude = Corrected Factor + Reading  
 Margin = Limit - Corrected. Amplitude

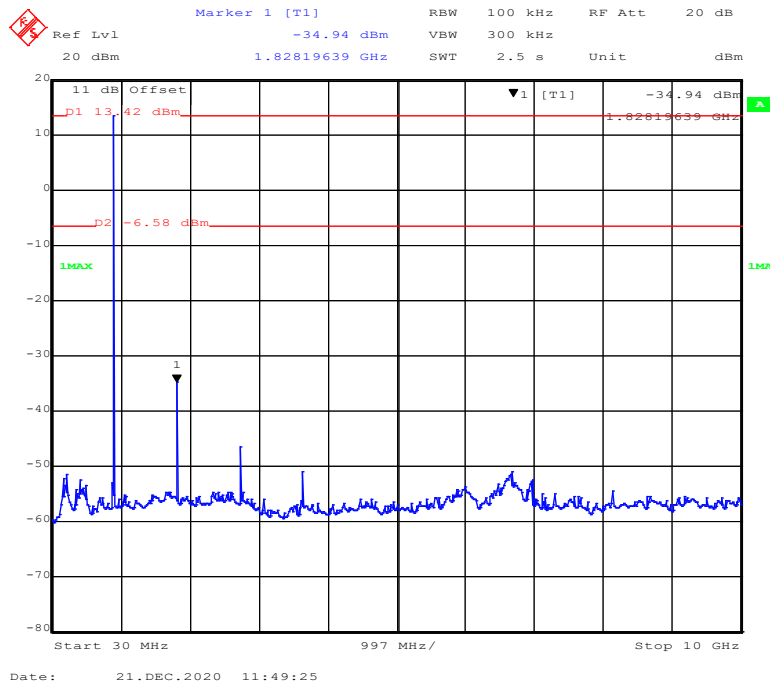
Frequency (MHz)	Corrected Amplitude (dBµV /m)	Rx Antenna		Turntable Degree	Corrected Factor (dB/m)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polar (H/V)				
904.00MHz							
902.00	39.98	100.0	H	253.0	1.1	46	6.02
902.00	38.76	150.0	V	112.0	1.1	46	7.24
925.00MHz							
928.00	34.59	100.0	H	337.0	1.5	46	11.41
928.00	33.47	150.0	V	249.0	1.5	46	12.53

### Conducted Spurious Emissions at Antenna Port:

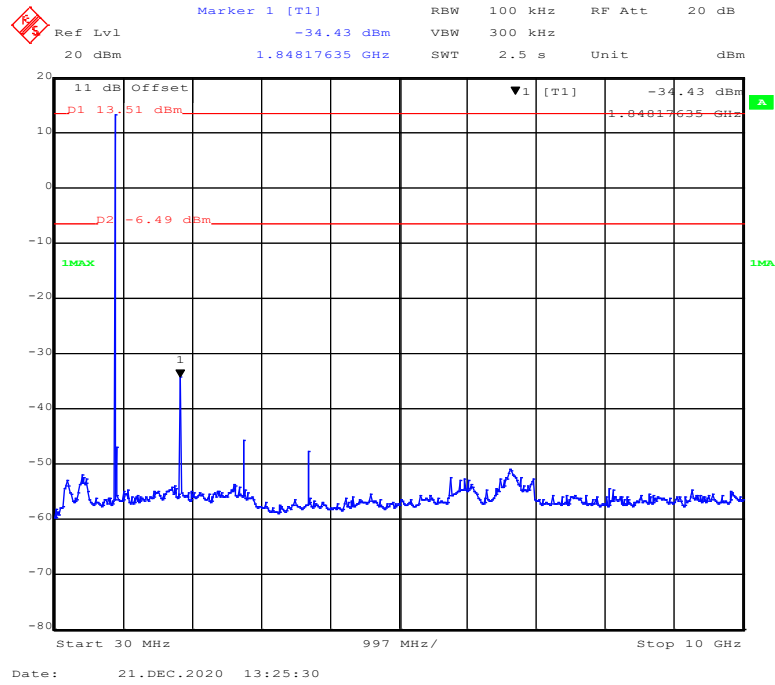
#### Low Channel



#### Middle Channel



### High Channel



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

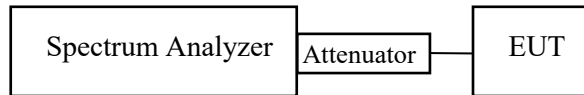
## Applicable Standard

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 KDB558074 D01 DTS Meas Guidance v05r02 sub-clause 8.1

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times$  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:	25.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Tyrone Wang on 2020-12-21.

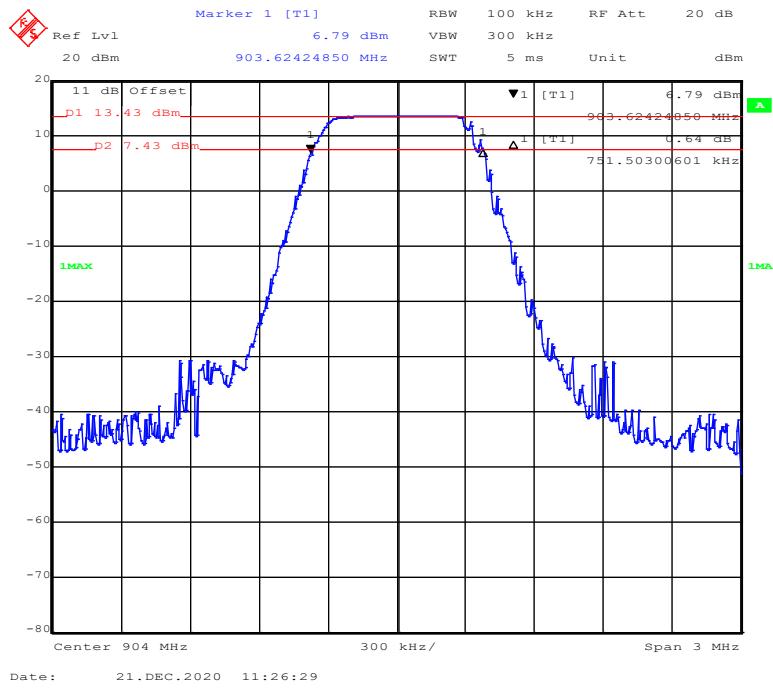
**Test Result:** Pass.

EUT operation mode: Transmitting

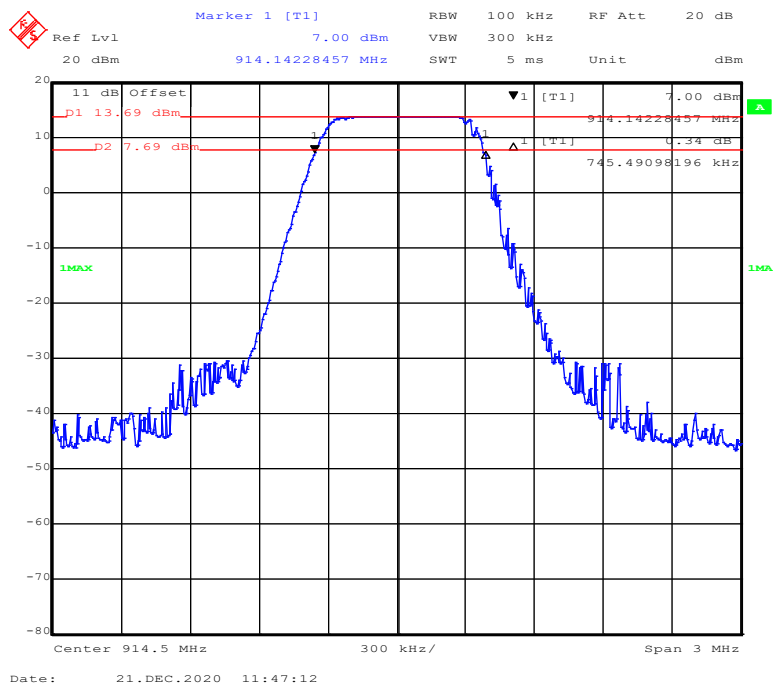
Channel	Frequency (MHz)	6 dB Emission Bandwidth (kHz)	Limit (MHz)
Low	904.00	751.5	$\geq 0.5$
Middle	914.50	745.5	$\geq 0.5$
High	925.00	739.5	$\geq 0.5$



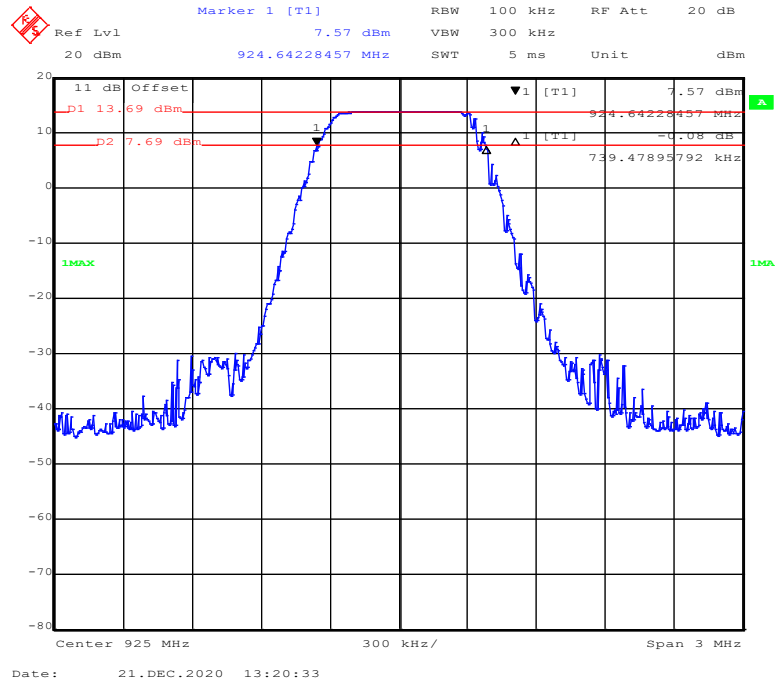
### Low Channel



### Middle Channel



### High Channel



# 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, 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.

## Test Procedure

According to KDB558074 D01 DTS Meas Guidance v05r02

1. Set the RBW  $\geq$  DTS bandwidth.
2. Set VBW  $\geq 3 \times$  RBW.
3. Set span  $\geq 3 \times$  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

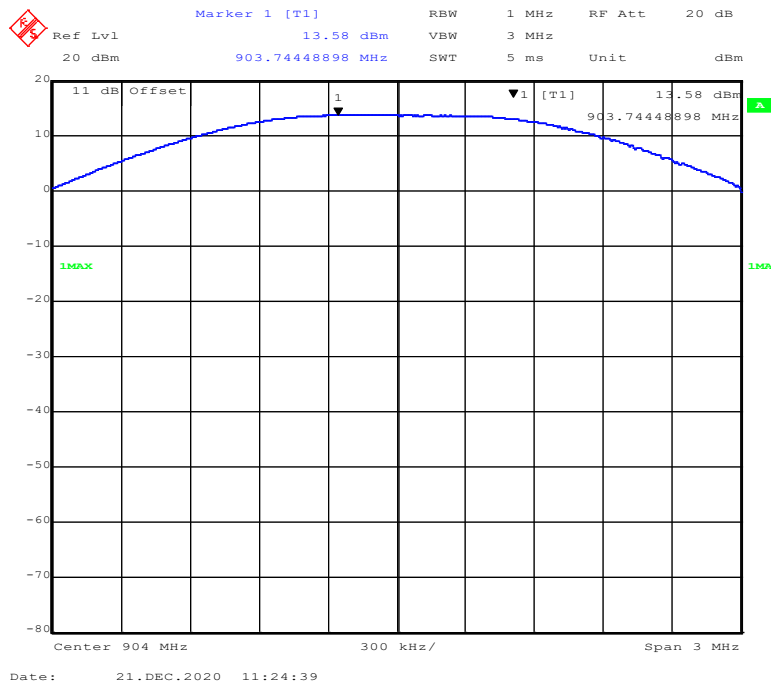
<b>Temperature:</b>	25.2°C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.2 kPa

*The testing was performed by Tyrone Wang on 2020-12-21.*

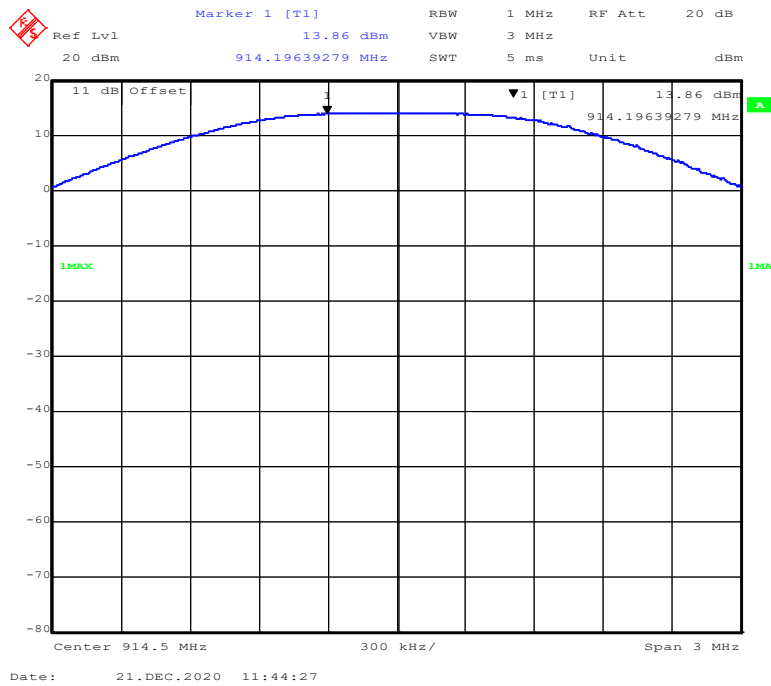
*EUT operation mode: Transmitting*

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Max Conducted Peak Output Power (dBm)</b>	<b>Limit (dBm)</b>	<b>Result</b>
Low	904.00	13.58	30	Pass
Middle	914.50	13.86	30	Pass
High	925.00	13.72	30	Pass

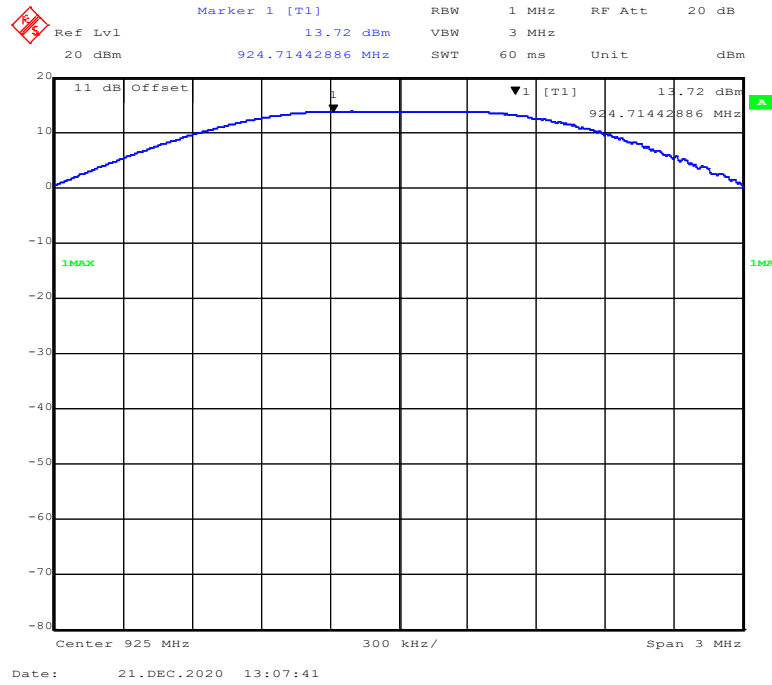
### Low Channel



### Middle Channel



### High Channel



# FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY 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 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)).

## Test Procedure

According to KDB558074 D01 DTS Meas Guidance v05r02 sub-clause 13.2 and ANSI C63.10-2013 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

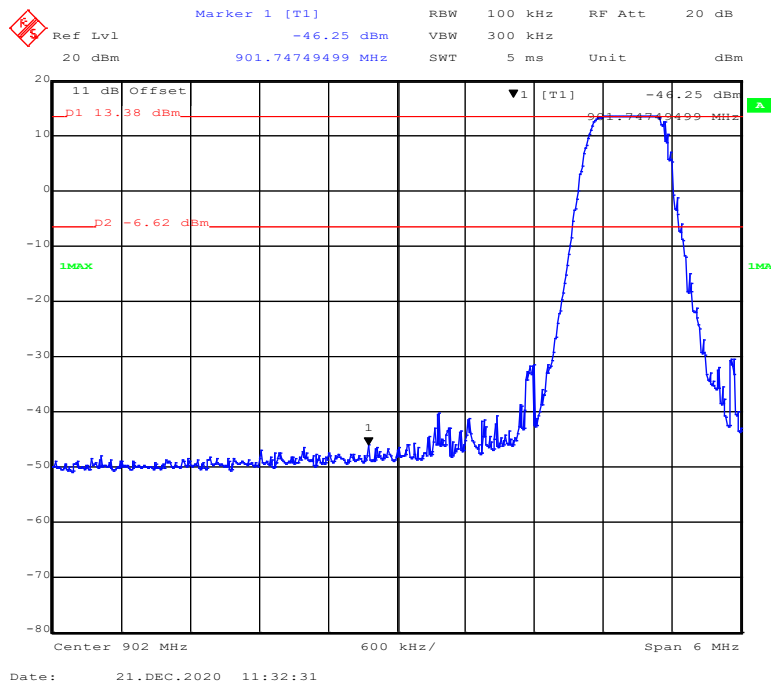
Temperature:	25.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

*The testing was performed by Tyrone Wang on 2020-12-21.*

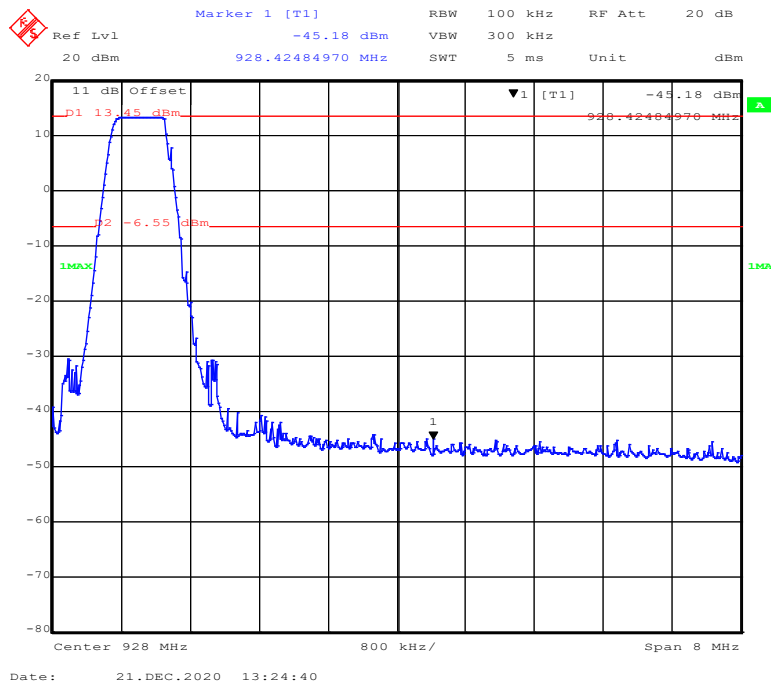
*EUT operation mode: Transmitting*

**Test Result:** *Compliant*

### Left Side



### Right Side





# 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 KDB558074 D01 DTS Meas Guidance v05r02 sub-clause 10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to:  $3\text{kHz} \leq \text{RBW} \leq 100\text{ kHz}$ .
3. Set the VBW  $\geq 3 \times \text{RBW}$ .
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

<b>Temperature:</b>	25.2°C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.2 kPa

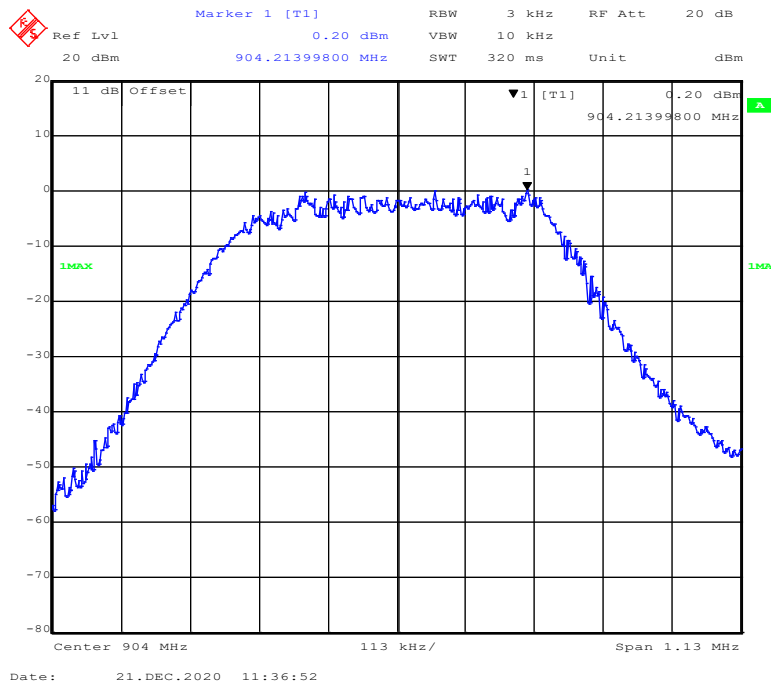
The testing was performed by Tyrone Wang on 2020-12-21.

EUT operation mode: Transmitting

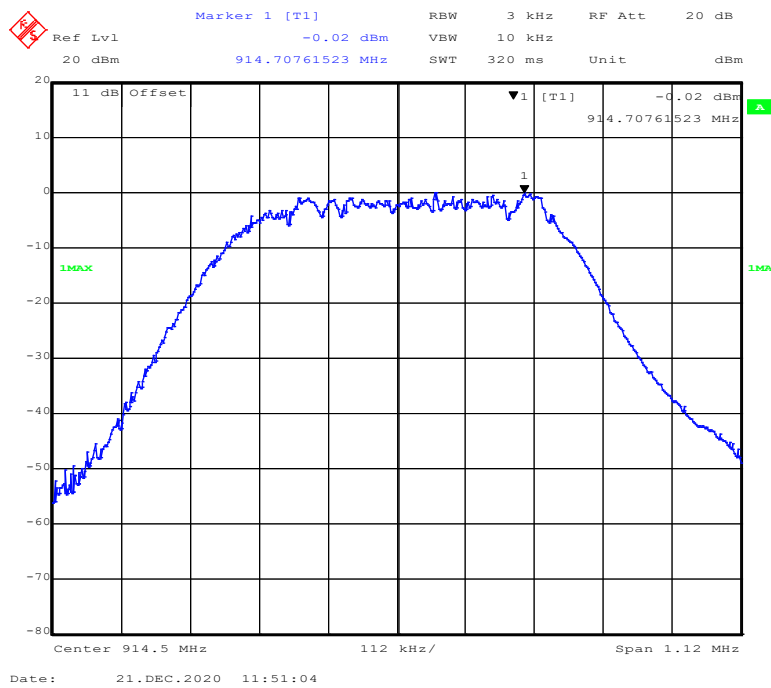
**Test Result:** Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	904.00	0.20	≤8
Middle	914.50	-0.02	≤8
High	925.00	-0.18	≤8

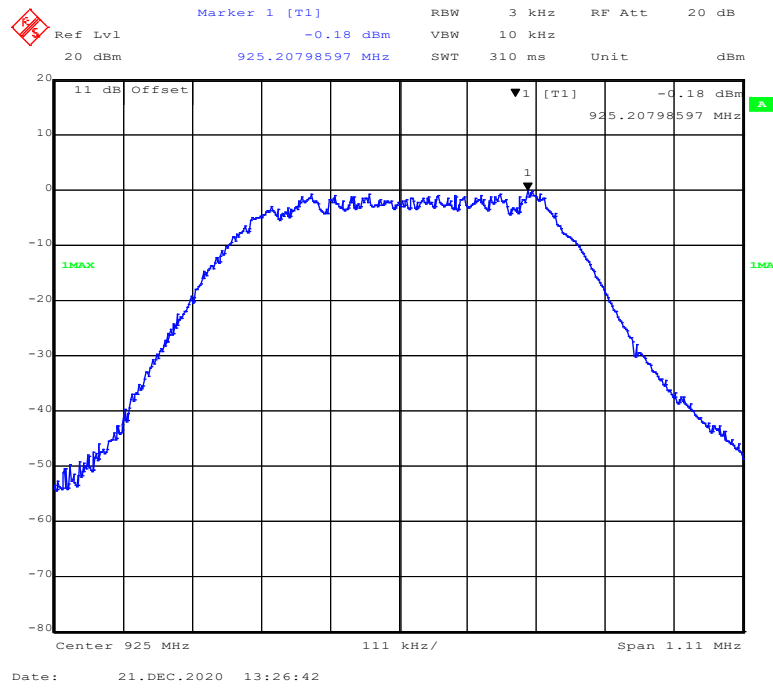
### Low Channel



### Middle Channel



### High Channel



### **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 \*\*\*\*\***