



**中认信通**

CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)



# TEST REPORT

**Applicant:** SAIN3 LLC

**Address:** 36 Berkley Drive, Newark, Delaware, 19702 United States

**FCC ID:** 2AN62-MU5

**Product Name:** Two way radio

**Model Number:** MU-5

**Standard(s):** 47 CFR Part 95 Subpart J  
ANSI C63.26-2015  
ANSI/TIA 603-E-2016

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

**Report Number:** CR22050024-00B

**Date Of Issue:** 2022-06-15

**Reviewed By:** Sun Zhong

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**Title:** Manager

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**Test Facility**

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

**Declarations**

China Certification ICT Co., Ltd (Dongguan) 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 a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

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

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## 1. GENERAL INFORMATION

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

<b>EUT Name:</b>	Two way radio
<b>EUT Model:</b>	MU-5
<b>Modulation Mode:</b>	FM
<b>Maximum Output Power: (Conducted)</b>	2 Watt
<b>Rated Input Voltage:</b>	DC 7.4V from battery or DC 5V from adapter
<b>Serial Number:</b>	CR2205024-RF-S1
<b>EUT Received Date:</b>	2022.05.19
<b>EUT Received Status:</b>	Good

#### Operation Frequency Detail:

Channel Number	Frequency (MHz)
<b>1</b>	<b>151.820</b>
2	151.880
3	151.940
4	154.570
<b>5</b>	<b>154.600</b>
Per C63.26-2015, section 5.1, the above frequencies in bold were performed the test.	

#### Antenna Information Detail ▲:

Antenna Manufacturer	Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
SAIN3 LLC	Helix	50	1.5 dBi/151-155MHz

#### Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
Adapter	Fujian Baofeng Electronic Co.,Ltd	BF-0501000	Input: AC 100-240V~50/60Hz 0.3A Output: DC 5.0V 1A

## 1.2 Description of Test Configuration

### 1.2.1 EUT Operation Condition:

<b>EUT Operation Mode:</b>	The system was configured for testing in Engineering Mode, which was provided by the manufacturer.
<b>Equipment Modifications:</b>	No
<b>EUT Exercise Software:</b>	No

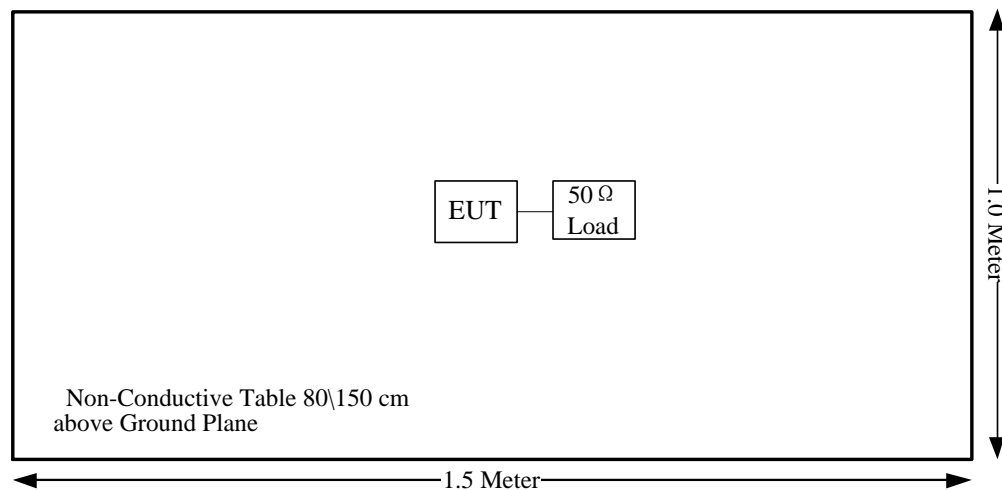
### 1.2.2 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
api	Load	50oml	50oml Load

### 1.2.3 Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

### 1.2.4 Block Diagram of Test Setup



### 1.3 Measurement Uncertainty

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

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	$\pm 5\%$
RF output power, conducted	$\pm 0.61\text{dB}$
Power Spectral Density, conducted	$\pm 0.61\text{ dB}$
Unwanted Emissions, radiated	30M~200MHz: 4.15 dB, 200M~1GHz: 5.61 dB, 1G~6GHz: 5.14 dB, 6G~18GHz: 5.93 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB
Unwanted Emissions, conducted	$\pm 1.26\text{ dB}$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
Duty Cycle	1%
RF Frequency	$\pm 0.082 \times 10^{-6}$
Audio Frequency/Low Pass Filter Response	4.02%
Modulation Limiting	1.19%

## 2. SUMMARY OF TEST RESULTS

Standard/Rule(s)	Description of Test	Results
§2.1055(d), §95.2765	MURS frequency accuracy	Compliant
§2.1046, §95.2767	MURS Transmitting Power	Compliant
§95.2771	MURS emission types	Compliant
§2.1049, §95.2773	MURS Authorized Bandwidth	Compliant
§95.2779	Emission Mask	Compliant
§2.1047, §95.2775	MURS Audio Filter	Compliant
§2.1051, §95.2779	MURS unwanted emissions limits- Spurious emissions at antenna terminals	Compliant
§2.1053, §95.2779	MURS unwanted emissions limits- Radiated Spurious emissions	Compliant

### 3. REQUIREMENTS AND TEST PROCEDURES

#### 3.1 MURS frequency accuracy

##### 3.1.1 Applicable Standard

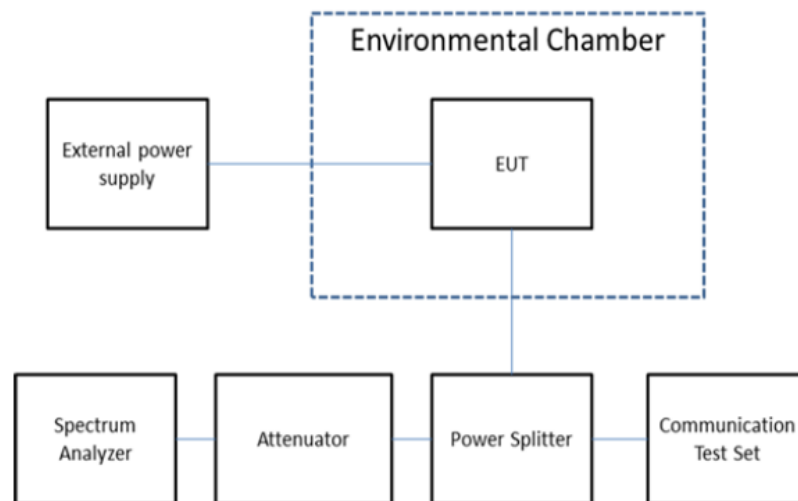
FCC §95.2765

Each MURS transmitter type must be designed to meet the applicable frequency tolerance and stability requirements of this section.

(a) MURS transmitters that operate with an emission bandwidth of 6.25 kHz or less must be designed such that the carrier frequencies remain within  $\pm 2.0$  parts-per-million (ppm) of the channel center frequencies specified in §95.2763 during normal operating conditions.

(b) MURS transmitters that operate with an emission bandwidth greater than 6.25 kHz must be designed such that the carrier frequencies remain within  $\pm 5.0$  ppm of the channel center frequencies specified in §95.2763 during normal operating conditions.

##### 3.1.2 EUT Setup Block Diagram



##### 3.1.3 Test Procedure

C63.26-2015, Clause 5.6

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

a) At 10 °C intervals of temperatures between -30 °C and +50 °C at the manufacturer's rated supply voltage, and

b) At +20 °C temperature and  $\pm 15\%$  supply voltage variations. If a product is specified to operate over a range of input voltage then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage. During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that



is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

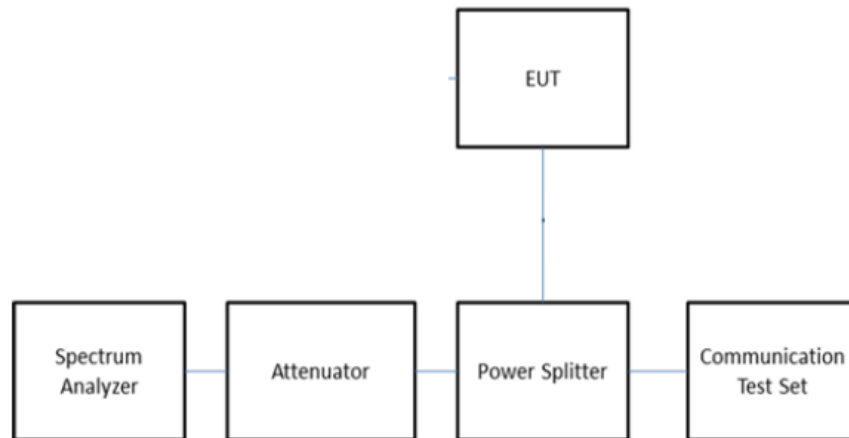
### 3.2 MURS Transmitting Power

#### 3.2.1 Applicable Standard

FCC §95.2767

Each MURS transmitter type must be designed such that the transmitter power output does not exceed 2 Watts under normal operating conditions.

#### 3.2.2 EUT Setup Block Diagram



#### 3.2.2 Test Procedure

C63.26-2015, Clause 5.2.3.3

This procedure can be used to measure the peak power in either a CW-like or noise-like narrowband RF signal. The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW  $\geq 3 \times$  RBW.

- Set the RBW  $\geq$  OBW.
- Set VBW  $\geq 3 \times$  RBW.
- Set span  $\geq 2 \times$  OBW.
- Sweep time  $\geq 10 \times$  (number of points in sweep)  $\times$  (transmission symbol period).
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the peak amplitude level

### 3.3 MURS emission types

#### 3.3.1 Applicable Standard

FCC §95.2771

A MURS transmitter must transmit only emission types A1D, A2B, A2D, A3E, F2B, F1D, F2D, F3E, and G3E. Emission types A3E, F3E and G3E may include selective calling or tone-operated squelch tones to establish or continue voice communications. MURS transmitters are prohibited from transmitting in the continuous carrier mode

#### 3.3.2 Judgment

Emission type is F3E.

### 3.4 MURS Authorized Bandwidth

#### 3.4.1 Applicable Standard

FCC §95.2773

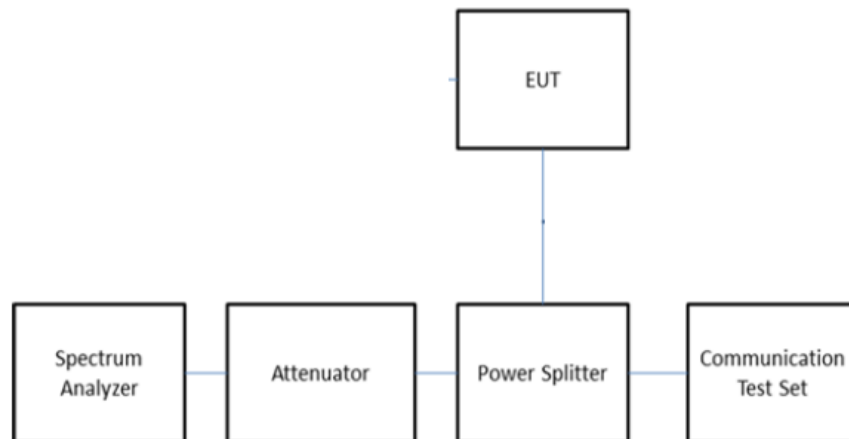
Each MURS transmitter type must be designed to meet the emission bandwidth limitations in this section.

(a) The occupied bandwidth of emissions transmitted on the center frequencies 151.820 MHz, 151.880 MHz, and 151.940 MHz must not exceed 11.25 kHz.

(b) The occupied bandwidth of emissions transmitted on the center frequencies 154.570 MHz and 154.600 MHz must not exceed 20.0 kHz.

(c) The occupied bandwidth of type A3E emissions must not exceed 8.0 kHz.

#### 3.4.2 EUT Setup Block Diagram



### 3.4.2 Test Procedure

C63.26-2015, Clause 5.4.4

The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring (99%) power bandwidth:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of  $1.5 \times \text{OBW}$  is sufficient).
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set  $\geq 3 \times \text{RBW}$ .
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.  
NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances.
- d) Set the detection mode to peak, and the trace mode to max-hold.
- e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.
- f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

### 3.5 MURS Audio Filter

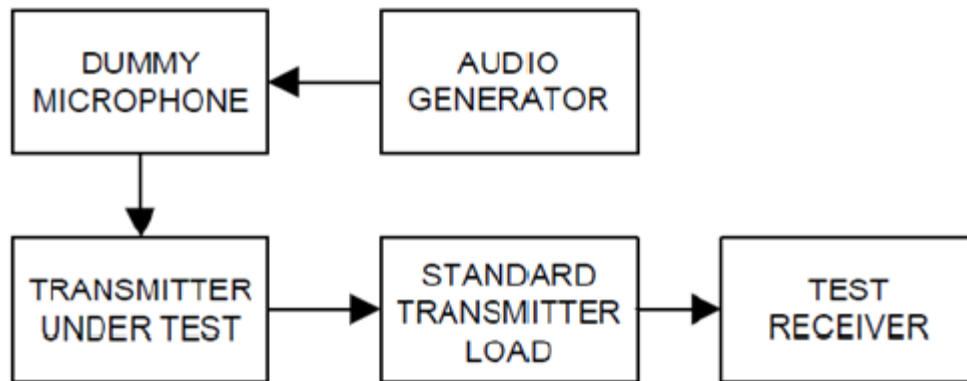
#### 3.5.1 Applicable Standard

FCC §95.2775

The audio filter referenced in §95.2779 must satisfy the requirements in this section.

- (a) The audio filter must be between the modulation limiter and the modulated stage of the transmitter.
- (b) At any frequency ( $f$  in kHz) between 3 and 15 kHz, the filter must have an attenuation of at least  $40 \log(f/3)$  dB more than the attenuation at 1 kHz. Above 15 kHz, it must have an attenuation of at least 28 dB more than the attenuation at 1 kHz.

### 3.5.2 EUT Setup Block Diagram



### 3.5.3 Test Procedure

C63.26-2015, Clause 5.3.2 Modulation limiting test methodology

Modulation limiting is the ability of a transmitter circuit to limit the transmitter from producing deviations in excess of a rated system deviation.

- a) Connect the equipment as illustrated in Figure 1.
- b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- c) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 0.25$  Hz to  $\geq 15000$  Hz. Turn the de-emphasis function off.
- d) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation. This is the 0 dB reference level.
- e) Increase the level from the audio generator by 20 dB in 5 dB increments recording the deviation as measured from the test receiver in each step. Verify that the audio level used to make the OBW measurement is included in the sweep.
- f) Repeat for step e) at 300 Hz, 2500 Hz and 3000 Hz at a minimum using the 0 dB reference level obtained in step d).
- g) Set the test receiver to measure peak negative deviation and repeat step d) through step f).
- h) The values recorded in step f) and step g) are the modulation limiting.
- i) Plot the data set as a percentage of deviation relative to the 0 dB reference point versus input voltage.

C63.26-2015, Clause 5.3.3.2 Audio frequency response test methodology—Constant Input

- a) Connect the equipment as illustrated in Figure 3.
- b) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for  $\leq 50$  Hz to  $\geq 15\ 000$  Hz. Turn the de-emphasis function off.
- c) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
- d) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
- e) Set the test receiver to measure rms deviation and record the deviation reading as DEVREF.
- f) Set the audio frequency generator to the desired test frequency between 300 Hz and 3000 Hz.

### 3.6 MURS unwanted emissions limits

#### 3.6.1 Applicable Standard

FCC §95.2779

The requirements in this section apply to each MURS transmitter type both with and without the connection of attachments, such as an external microphone, power cord and/or antenna.

(a) *Emission masks*. Emission masks applicable to transmitting equipment in the MURS are defined by the requirements in the following table. The numbers in the paragraphs column refer to attenuation requirement rule paragraph numbers under paragraph (b) of this section. The words “audio filter” refer to the audio filter described in §95.2775.

Channel center frequencies (MHz)	Paragraphs
151.820, 151.880 and 151.940	(1), (2).
154.570 & 154.600, with audio filter	(3), (4), (7).
154.570 & 154.600, without audio filter	(5), (6), (7).

(1) Each MURS transmitter type that transmits F3E or G3E emissions on 154.570 MHz or 154.600 MHz and incorporates an audio filter satisfying the requirements of §95.2775 in its design may comply with the less stringent unwanted emissions attenuation requirements set forth in paragraphs (b)(3), (4), and (7) of this section.

(2) Each MURS transmitter type that transmits on 154.570 MHz or 154.600 MHz, but does not incorporate an audio filter satisfying the requirements of §95.2775 in its design, must comply with the unwanted emissions attenuation requirements set forth in paragraphs (b)(5) through (7) of this section.

(b) *Attenuation requirements*. The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

(1)  $7.27(f_d - 2.88 \text{ kHz})$  dB on any frequency removed from the channel center frequency by a displacement frequency ( $f_d$  in kHz) that is more than 5.625 kHz, but not more than 12.5 kHz.

(2)  $50 + 10 \log(P)$  dB or 70 dB, whichever is the lesser attenuation, on any frequency removed from the channel center frequency by more than 12.5 kHz.

(3) 25 dB on any frequency removed from the channel center frequency by more than 10 kHz, but not more than 20 kHz.

(4) 35 dB on any frequency removed from the channel center frequency by more than 20 kHz, but not more than 50 kHz.

(5)  $83 \log(f_d \div 5)$  dB on any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) that is more than 5 kHz, but not more than 10 kHz.

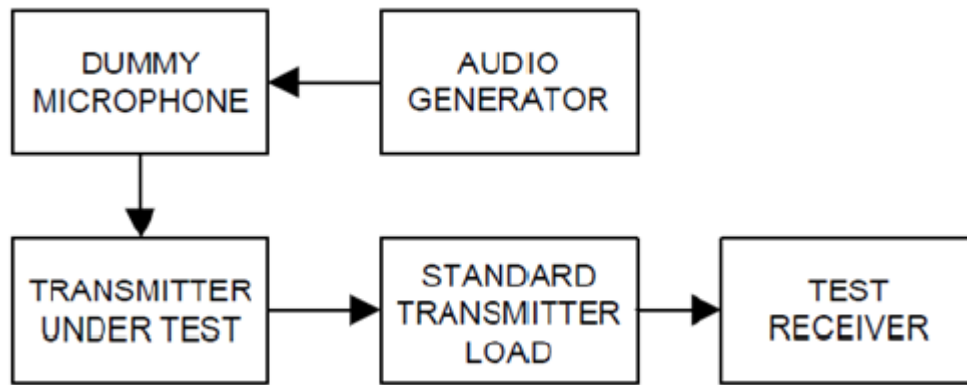
(6)  $29 \log(f_d \div 11)$  dB or 50 dB, whichever is the lesser attenuation on any frequency removed from the channel center frequency by a displacement frequency ( $f_d$  in kHz) that is more than 10 kHz, but not more than 50 kHz.

(7)  $43 + 10 \log(P)$  dB on any frequency removed from the channel center frequency by more than 50 kHz.

(c) *Measurement bandwidths*. The power of unwanted emissions in the frequency bands specified in paragraphs (b)(1) and (3) through (6) of this section is measured with a reference bandwidth of 300 Hz. The power of unwanted emissions in the frequency ranges specified in paragraphs (b)(2) and (7) of this section is measured with a reference bandwidth of at least 30 kHz.

### 3.6.2 Spurious emissions at antenna terminals.

#### 3.6.2.1 EUT Setup Block Diagram



#### 3.6.2.2 Test Procedure

C63.26-2015, Clause 5.7.4

a) Set the spectrum analyzer start frequency to the lowest frequency generated by the EUT, without going below 9 kHz, and the stop frequency to the lower frequency covered by the measurements previously performed in 5.7.3. As an alternative, the stop frequency can be set to the value specified in 5.1.1, depending on the EUT operating range, if the resulting plot can clearly demonstrate compliance for all frequencies not addressed by the out-of-band emissions measurements performed as per 5.7.3.

b) When using an average power (rms) detector, ensure that the number of points in the sweep  $\geq 2 \times (\text{span} / \text{RBW})$ . This may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the spectrum analyzer capabilities. This requirement does not apply to peak-detected power measurements. When average power is specified by the applicable regulation, a peak-detector can be utilized for preliminary measurements to accommodate wider frequency spans. Any emissions found in the preliminary measurement to exceed the applicable limit(s) shall be further examined using a power averaging (rms) detector with the minimum number of measurement points as defined above.

c) The sweep time should be set to auto-couple for performing peak-detector measurements. For measurements that use a power averaging (rms) detector, the sweep time shall be set as described for out-of-band emissions measurements in item d) of 5.7.3.

d) Identify and measure the highest spurious emission levels in each frequency range. It is not necessary to re-measure the out-of-band emissions as a part of this test. Record the frequencies and amplitudes corresponding to the measured emissions and capture the data plots.

e) Repeat step b) through step d) for the upper spurious emission frequency range if not already captured by a wide span measurement performed as per the alternative provided in step a). The upper frequency for this measurement is defined in 5.1.1 as a function of the EUT operating range.

f) Compare the results with the corresponding limit in the applicable regulation.

g) The test report shall include the data plots of the measuring instrument display and the measured data.

### 3.6.3 Radiated Spurious emissions

#### Test setup:

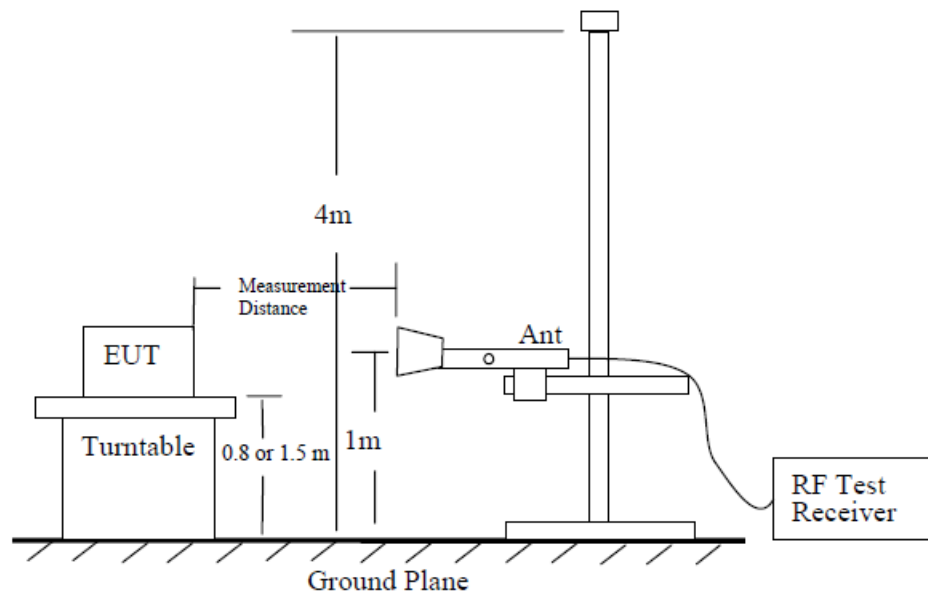


Figure 6—Test site-up for radiated ERP and/or EIRP measurements

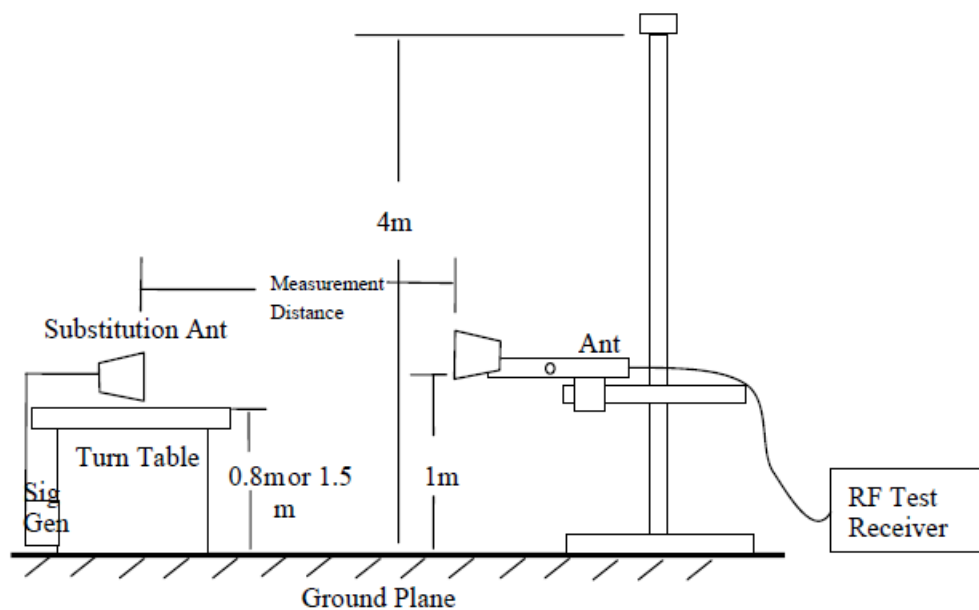


Figure 7—Substitution method set-up for radiated emission



**Test Procedure:**

## ANSI C63.26-2015 Section 5.5.3

- a) Place the EUT in the center of the turntable. The EUT shall be configured to transmit into the standard non-radiating load (for measuring radiated spurious emissions), connected with cables of minimal length unless specified otherwise. If the EUT uses an adjustable antenna, the antenna shall be positioned to the length that produces the worst case emission at the fundamental operating frequency.
- b) Each emission under consideration shall be evaluated:
  - 1) Raise and lower the measurement antenna in accordance 5.5.2, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
  - 2) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
  - 3) Return the turntable to the azimuth where the highest emission amplitude level was observed.
  - 4) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
  - 5) Record the measured emission amplitude level and frequency using the appropriate RBW.
- c) Repeat step b) for each emission frequency with the measurement antenna oriented in both the horizontal and vertical polarizations to determine the orientation that gives the maximum emissions amplitude.
- d) Set-up the substitution measurement with the reference point of the substitution antenna located as near as possible to where the center of the EUT radiating element was located during the initial EUT measurement.
- e) Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
- f) Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
- g) For each emission that was detected and measured in the initial test [i.e., in step b) and step c)]:
  - 1) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.
  - 2) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step b) and step c).
  - 3) Record the output power level of the signal generator when equivalence is achieved in step 2).
- h) Repeat step e) through step g) with the measurement antenna oriented in the opposite polarization.
- i) Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:
 
$$P_e = P_s(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBd)}$$
 where
 

$P_e$	= equivalent emission power in dBm
$P_s$	= source (signal generator) power in dBm

 NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.
- j) Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:  $\text{gain (dBd)} = \text{gain (dBi)} - 2.15 \text{ dB}$ . If necessary, the antenna gain can be calculated from calibrated antenna factor information
- k) Provide the complete measurement results as a part of the test report.



## 4. TEST DATA AND RESULTS

### 4.1 MURS Frequency Accuracy

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

#### Environmental Conditions:

Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3
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#### Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
Weinschel	Power splitter	1515	RA915	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21
BACL	TEMP&HUMI Test Chamber	BTH-150	30026	2021-07-22	2022-07-21
UNI-T	Multimeter	UT39A+	C210582554	2021-09-30	2022-09-29
ZHAOXIN	DC Power Supply	RXN-6010D	21R6010D0912386	N/A	N/A

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

#### Test Data:

Test Frequency:		151.82	MHz	
Temperature	Voltage	Reading	Frequency Error	Limit
°C	Vdc	MHz	ppm	ppm
-30	7.4	151.8204354	2.87	±5
-20		151.8204012	2.64	
-10		151.8203785	2.49	
0		151.8203408	2.25	
10		151.8202014	1.33	
20		151.8204208	2.77	
30		151.8201578	1.04	
40		151.8200236	0.16	
50		151.8200568	0.37	
20	6.5	151.8201547	1.02	
20	8.4	151.8200035	0.02	

Test Frequency:		154.6	MHz	
Temperature	Voltage	Reading	Frequency Error	Limit
°C	Vdc	MHz	ppm	ppm
-30	7.4	154.59999205	-0.05	±5
-20		154.59999505	-0.03	
-10		154.59999106	-0.06	
0		154.59999845	-0.01	
10		154.59999950	0.00	
20		154.60042084	2.72	
30		154.60020025	1.30	
40		154.60014580	0.94	
50		154.60005843	0.38	
20	6.5	154.60032584	2.11	
20	8.4	154.60025874	1.67	

**4.2 MURS Output Power**

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

**Environmental Conditions:**

Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3
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**Test Equipment List and Details:**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Power splitter	1515	RA915	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21

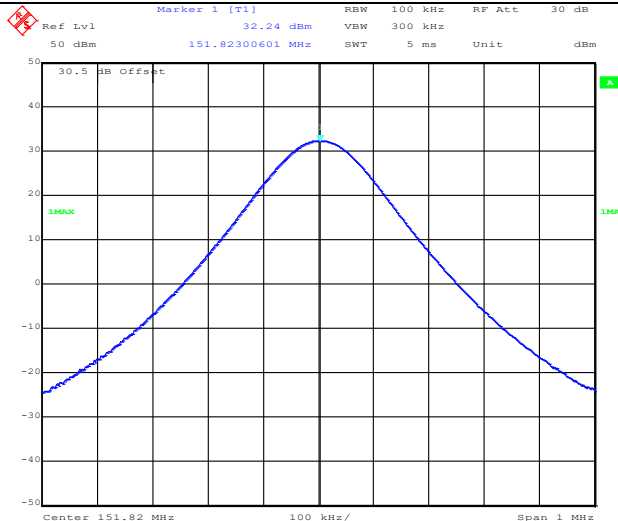
*\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

**Test Data:**

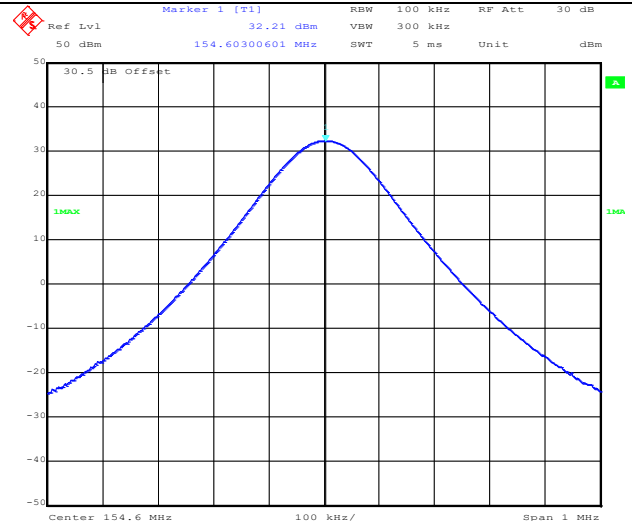
Test Frequency (MHz)	Conducted Output power (dBm)	Limit (dBm)
151.82	32.24	33.0
154.6	32.21	33.0

## Conducted Output power

151.82 MHz



154.60 MHz



**4.3 MURS Authorized Bandwidth And Emission Mask**

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3

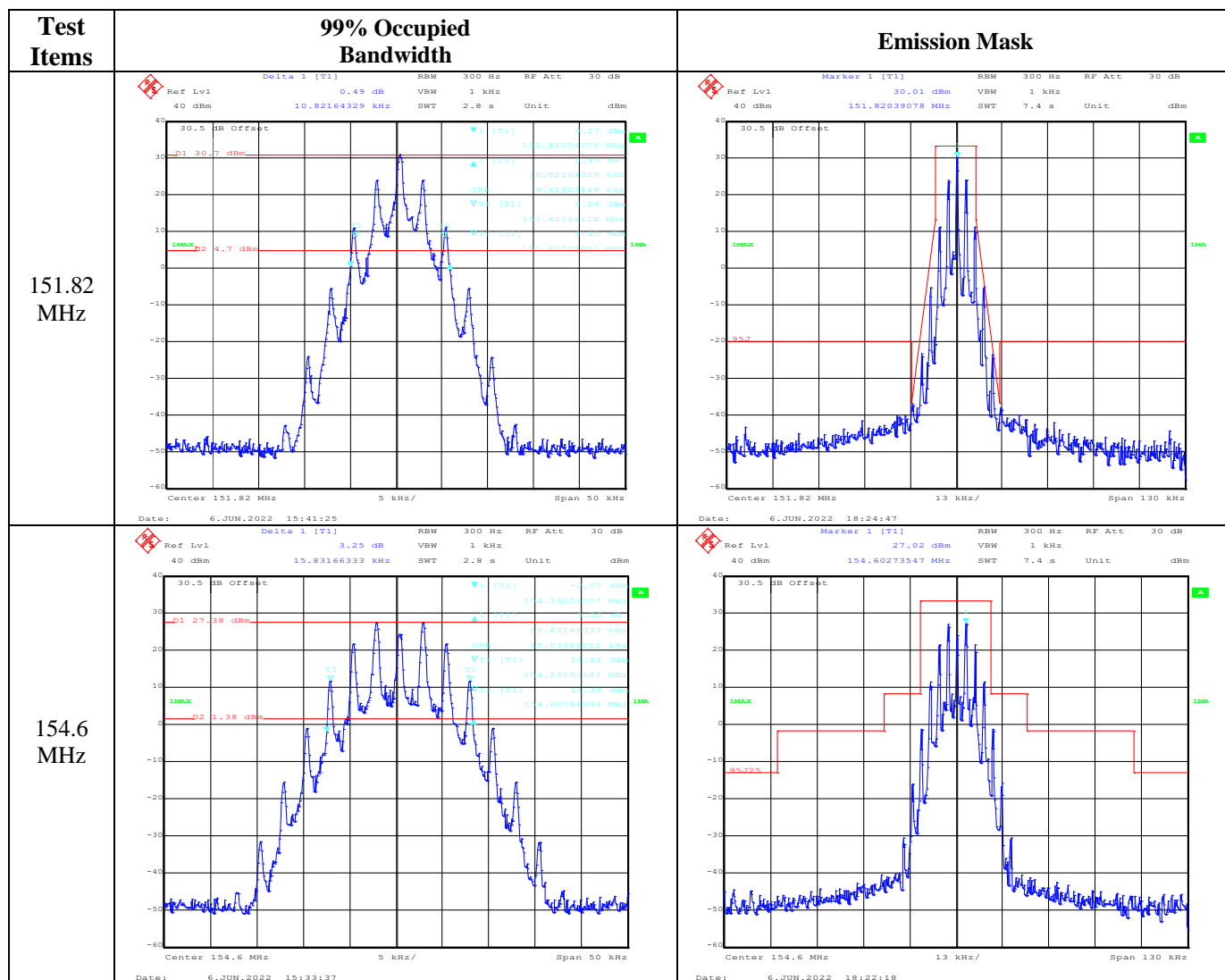
**Test Equipment List and Details:**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Power splitter	1515	RA915	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data:**

Test Frequency (MHz)	99% Occupied Bandwidth (kHz)	Limit (kHz)
151.82	9.62	11.25
154.6	15.03	20



**4.4 MURS Audio Filter Requirement**

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

**Environmental Conditions:**

Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3
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**Test Equipment List and Details:**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Power splitter	1515	RA915	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21

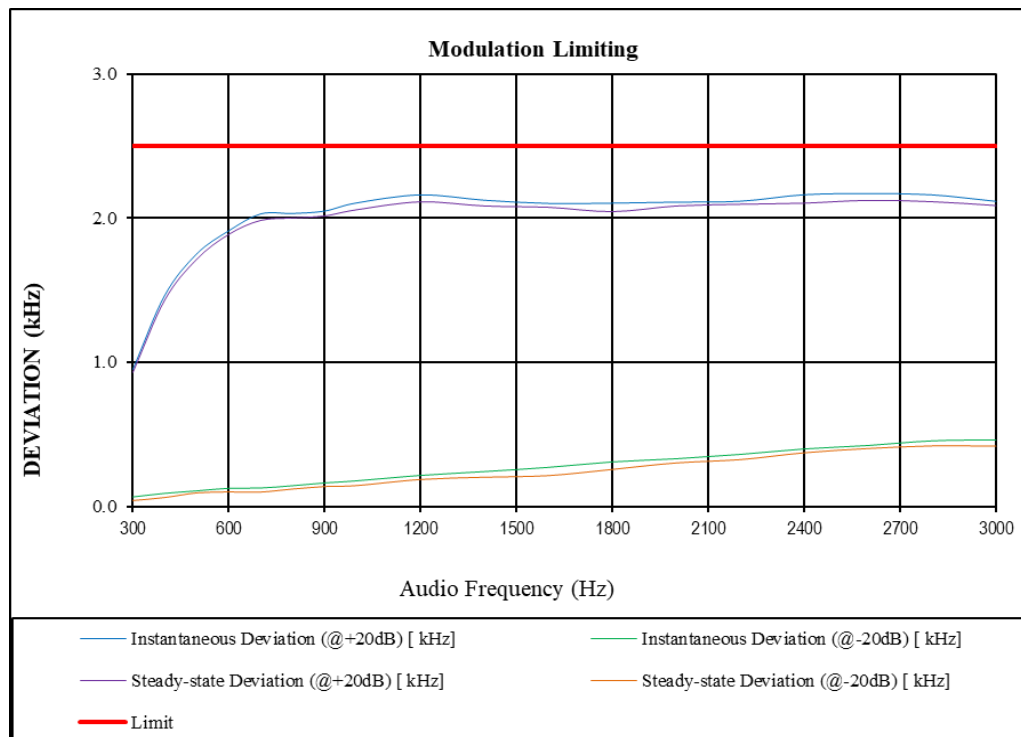
*\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

**Test Data:**

## MODULATION LIMITING

Carrier Frequency: 151.82 MHz

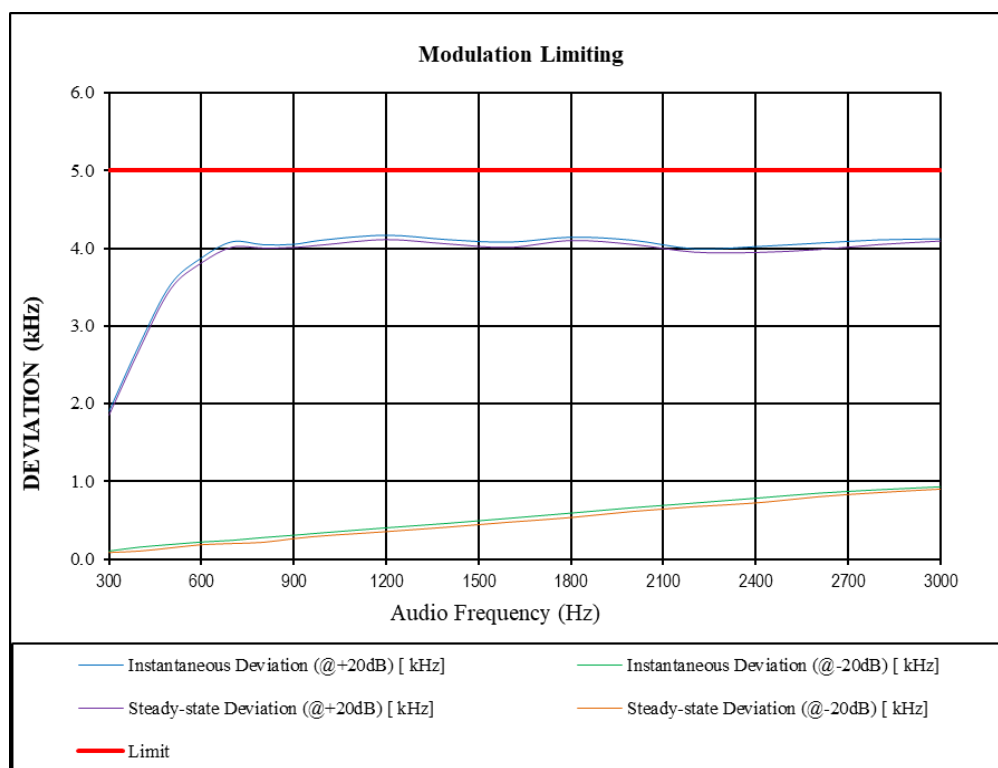
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [KHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [KHz]	Deviation (@-20dB) [kHz]	
300	0.951	0.066	0.930	0.041	2.5
400	1.464	0.091	1.432	0.062	2.5
500	1.752	0.108	1.715	0.094	2.5
600	1.912	0.126	1.887	0.101	2.5
700	2.029	0.128	1.984	0.100	2.5
800	2.032	0.144	2.001	0.121	2.5
900	2.049	0.163	2.015	0.138	2.5
1000	2.105	0.178	2.058	0.145	2.5
1200	2.161	0.215	2.113	0.187	2.5
1400	2.124	0.242	2.084	0.203	2.5
1600	2.102	0.271	2.075	0.214	2.5
1800	2.104	0.309	2.045	0.257	2.5
2000	2.111	0.331	2.084	0.302	2.5
2200	2.117	0.361	2.096	0.325	2.5
2400	2.162	0.399	2.104	0.372	2.5
2600	2.170	0.423	2.123	0.402	2.5
2800	2.161	0.455	2.114	0.420	2.5
3000	2.116	0.462	2.087	0.418	2.5





Carrier Frequency: 154.6 MHz

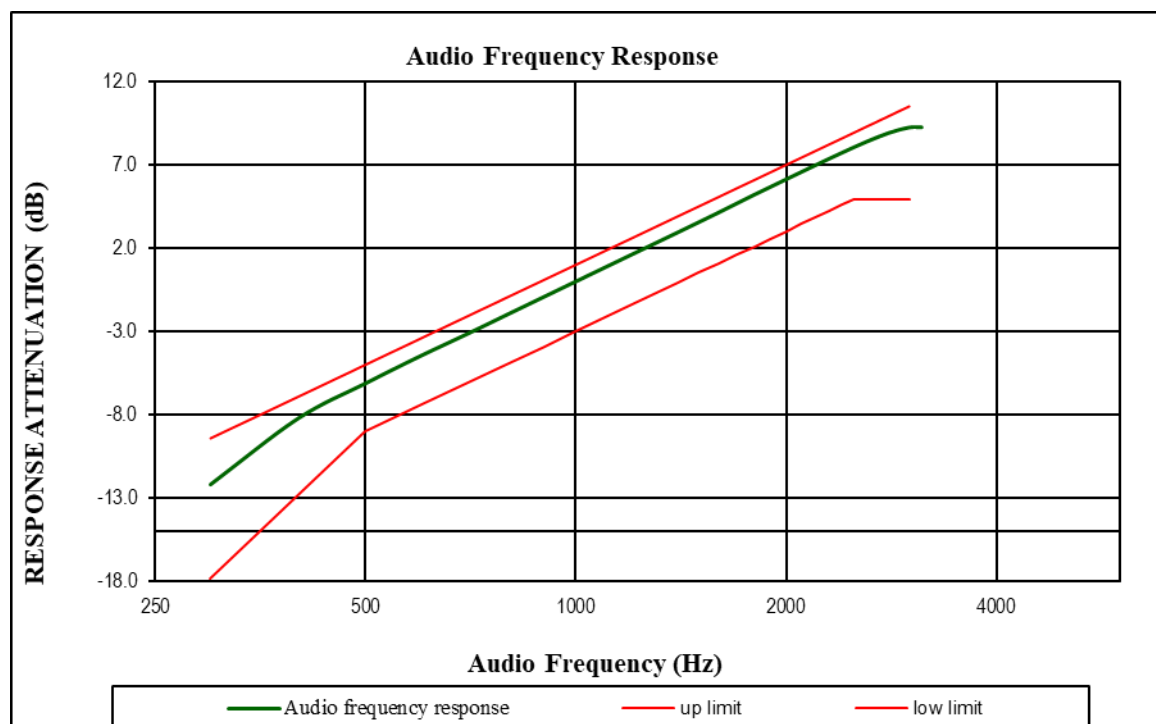
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit [kHz]
	Deviation (@+20dB) [KHz]	Deviation (@-20dB) [kHz]	Deviation (@+20dB) [KHz]	Deviation (@-20dB) [kHz]	
300	1.904	0.104	1.854	0.086	5
400	2.772	0.155	2.711	0.104	5
500	3.534	0.189	3.476	0.145	5
600	3.876	0.221	3.812	0.186	5
700	4.085	0.242	4.015	0.201	5
800	4.047	0.278	4.004	0.216	5
900	4.052	0.308	4.012	0.264	5
1000	4.109	0.341	4.046	0.301	5
1200	4.169	0.403	4.113	0.354	5
1400	4.112	0.461	4.057	0.412	5
1600	4.080	0.526	4.012	0.476	5
1800	4.144	0.593	4.101	0.536	5
2000	4.105	0.662	4.051	0.614	5
2200	3.995	0.722	3.952	0.675	5
2400	4.022	0.784	3.947	0.723	5
2600	4.067	0.848	3.983	0.802	5
2800	4.109	0.893	4.049	0.857	5
3000	4.122	0.932	4.094	0.901	5



### Audio Frequency Response

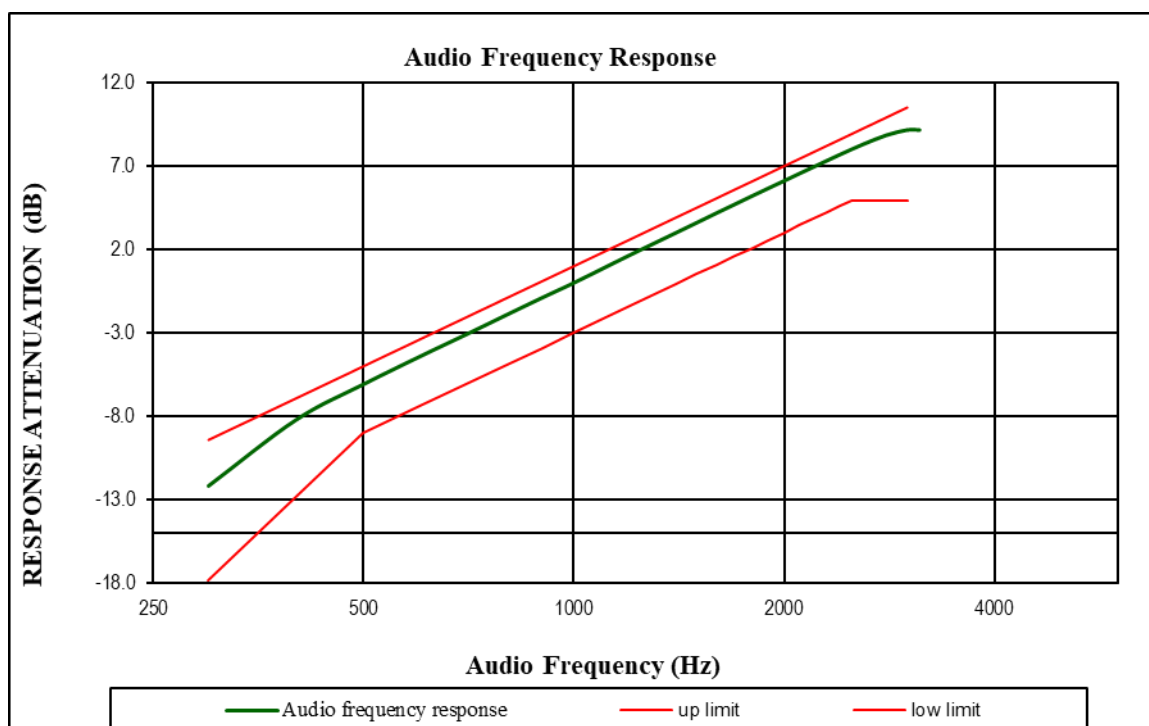
Carrier Frequency: 151.82 MHz

Audio Frequency (Hz)	Response Attenuation (dB)
300	-12.19
400	-8.24
500	-6.12
600	-4.46
700	-3.14
800	-1.96
900	-0.93
1000	0.00
1200	1.60
1400	2.95
1600	4.14
1800	5.21
2000	6.13
2200	6.97
2400	7.71
2600	8.37
2800	8.91
3000	9.24
3125	9.25



Carrier Frequency: 154.6 MHz

Audio Frequency (Hz)	Response Attenuation (dB)
300	-12.18
400	-8.23
500	-6.08
600	-4.45
700	-3.11
800	-1.94
900	-0.90
1000	0.00
1200	1.64
1400	3.00
1600	4.18
1800	5.21
2000	6.11
2200	6.94
2400	7.68
2600	8.32
2800	8.85
3000	9.16
3125	9.16

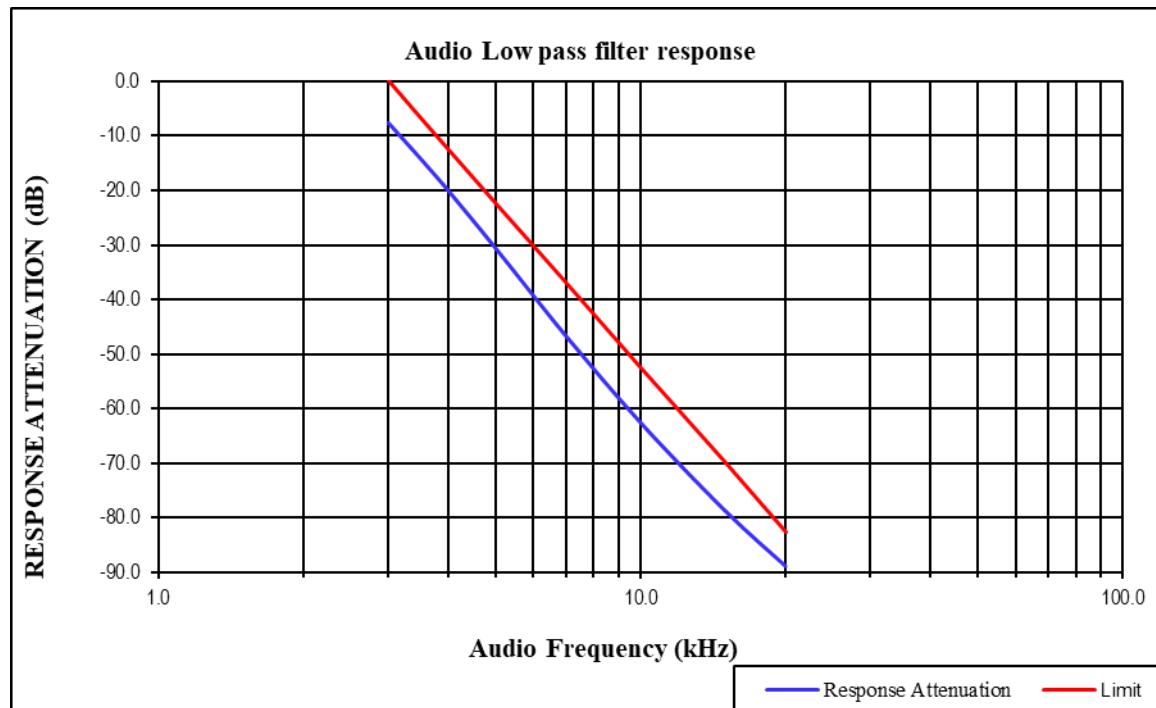


**Audio Low Pass Filter Response**

(More stricter limit was used)

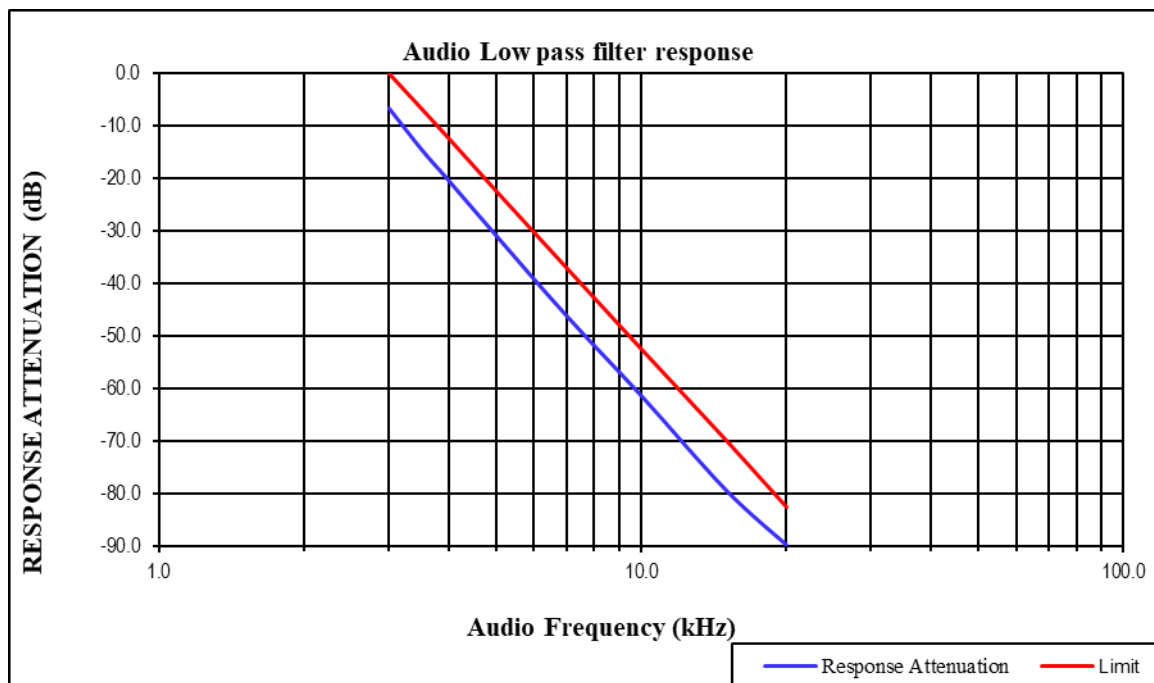
Carrier Frequency: 151.86 MHz

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-7.6	0.0
3.5	-14.2	-6.7
4.0	-20.1	-12.5
5.0	-30.5	-22.2
7.0	-46.6	-36.8
10.0	-62.5	-52.3
15.0	-78.7	-69.9
20.0	-88.8	-82.5



Carrier Frequency: 154.6 MHz  
(More stricter limit was used)

Audio Frequency (kHz)	Response Attenuation (dB)	Limit (dB)
3.0	-6.6	0.0
3.5	-14.4	-6.7
4.0	-20.5	-12.5
5.0	-30.8	-22.2
7.0	-46.1	-36.8
10.0	-61.3	-52.3
15.0	-79.3	-69.9
20.0	-89.7	-82.5



**4.5 MURS Unwanted Emissions Limits-Spurious Emissions At Antenna Terminals**

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

**Environmental Conditions:**

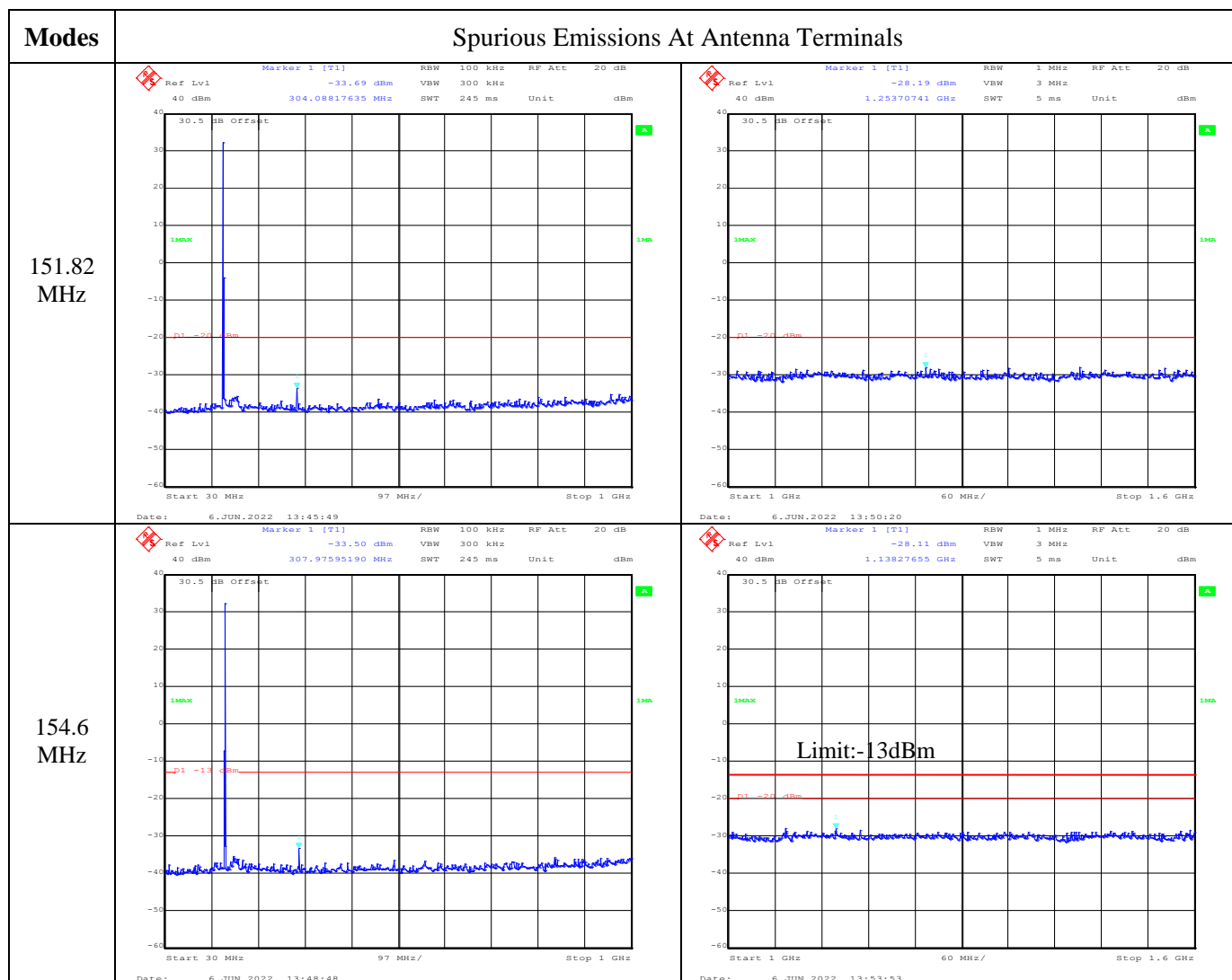
Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3
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**Test Equipment List and Details:**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Signal Analyzer	FSIQ26	831929/006	2021-07-22	2022-07-21
YINSAIGE	Coaxial Cable	SS402	SJ0100003	Each time	N/A
zhuoxiang	Coaxial Cable	SMA-178	211002	Each time	N/A
Mini-Circuits	DC Block	BLK-18-S+	1554404	Each time	N/A
Weinschel	Power splitter	1515	RA915	Each time	N/A
Weinschel	Coaxial Attenuators	53-20-34	LN751	Each time	N/A
HP	RF Communications Test Set	8920A	3438A05209	2021-07-22	2022-07-21

*\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).*

**Test Data:**



**4.6 MURS Unwanted Emissions Limits- Radiated Spurious Emissions**

Serial Number:	CR2205024-RF-S1	Test Date:	2022-06-06
Test Site:	RF	Test Mode:	Transmitting
Tester:	Morpheus Shi	Test Result:	Pass

**Environmental Conditions:**

Temperature: (°C)	27.8	Relative Humidity: (%)	65	ATM Pressure: (kPa)	100.3
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**Test Equipment List and Details:**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB6	A082520-5	2020-10-19	2023-10-18
R&S	EMI Test Receiver	ESR3	102724	2021-07-22	2022-07-21
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2021-07-18	2022-07-17
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2021-07-18	2022-07-17
Sonoma	Amplifier	310N	186165	2021-07-18	2022-07-17
EMCO	Adjustable Dipole Antenna	3121C	9109-756	N/A	N/A
MICRO-COAX	Coaxial Cable	UFA210B-0-0720-300300	99G1448	2021-07-25	2022-07-24
Agilent	Signal Generator	E8247C	MY43321352	2022-04-25	2023-04-24
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020-10-13	2023-10-12
R&S	Spectrum Analyzer	FSV40	101591	2021-07-22	2022-07-21
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2021-08-08	2022-08-07
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2021-08-08	2022-08-07
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2021-11-10	2022-11-09
AH	Double Ridge Guide Horn Antenna	SAS-571	1396	2021-10-18	2024-10-17
MICRO-COAX	Coaxial Cable	UFA210B-0-0720-300300	99G1448	2021-07-25	2022-07-24

\* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data:**

Note:

Test only performed with High power level. The device can be mounted in multiple orientations, test was performed with X,Y, Z Axis according to C63.26 Figure 5, the worst orientation was photographed and it's data was recorded.



Frequency (MHz)	Polar (H/V)	Receiver Reading (dB μV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Substituted Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
frequency: 151.82 MHz								
303.64	H	37.22	-73.45	0.00	0.34	-73.79	-20.00	53.79
303.64	V	27.78	-80.94	0.00	0.34	-81.28	-20.00	61.28
455.46	H	34.49	-73.42	0.00	0.42	-73.84	-20.00	53.84
455.46	V	31.09	-73.17	0.00	0.42	-73.59	-20.00	53.59
607.28	H	32.03	-72.77	0.00	0.49	-73.26	-20.00	53.26
607.28	V	28.54	-74.99	0.00	0.49	-75.48	-20.00	55.48
759.10	H	42.92	-60.34	0.00	0.52	-60.86	-20.00	40.86
759.10	V	31.57	-68.21	0.00	0.52	-68.73	-20.00	48.73
910.92	H	35.77	-63.20	0.00	0.55	-63.75	-20.00	43.75
910.92	V	31.19	-65.00	0.00	0.55	-65.55	-20.00	45.55
1062.74	H	36.87	-65.56	7.28	0.66	-58.94	-20.00	38.94
1062.74	V	34.82	-67.99	7.28	0.66	-61.37	-20.00	41.37
1214.56	H	36.54	-66.30	7.70	0.69	-59.29	-20.00	39.29
1214.56	V	35.91	-67.63	7.70	0.69	-60.62	-20.00	40.62
1366.38	H	37.26	-66.12	8.13	0.76	-58.75	-20.00	38.75
1366.38	V	36.82	-66.74	8.13	0.76	-59.37	-20.00	39.37
frequency: 154.6MHz								
309.20	H	37.63	-72.95	0.00	0.34	-73.29	-13.00	60.29
309.20	V	28.78	-79.79	0.00	0.34	-80.13	-13.00	67.13
463.80	H	32.95	-74.76	0.00	0.42	-75.18	-13.00	62.18
463.80	V	30.55	-73.41	0.00	0.42	-73.83	-13.00	60.83
618.40	H	35.89	-68.88	0.00	0.49	-69.37	-13.00	56.37
618.40	V	30.91	-72.35	0.00	0.49	-72.84	-13.00	59.84
773.00	H	44.16	-58.79	0.00	0.55	-59.34	-13.00	46.34
773.00	V	31.33	-68.10	0.00	0.55	-68.65	-13.00	55.65
927.60	H	39.10	-59.37	0.00	0.63	-60.00	-13.00	47.00
927.60	V	31.25	-64.58	0.00	0.63	-65.21	-13.00	52.21
1082.20	H	38.62	-63.41	7.33	0.66	-56.74	-13.00	43.74
1082.20	V	35.42	-67.05	7.33	0.66	-60.38	-13.00	47.38
1236.80	H	37.16	-65.65	7.76	0.68	-58.57	-13.00	45.57
1236.80	V	36.29	-67.16	7.76	0.68	-60.08	-13.00	47.08
1391.40	H	37.66	-65.97	8.20	0.72	-58.49	-13.00	45.49
1391.40	V	37.45	-66.25	8.20	0.72	-58.77	-13.00	45.77

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Note 2:

Absolute Level = Substituted Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

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