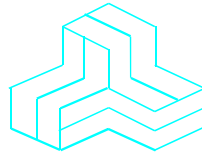


# ENGINEERING TEST REPORT



**VHF Transceiver  
Model: IC-V10MR  
FCC ID: AFJ425900**

*Applicant:*

**ICOM Incorporated**  
1-1-32, Kamiminami, Hirano-ku  
Osaka, Japan, 547-0003

**Tested in Accordance With**

**Federal Communications Commission (FCC)  
47 CFR, Parts 2 and 95 (Subpart J)**

**UltraTech's File No.: 20ICOM531\_FCC95J**

This Test report is Issued under the Authority of  
Tri M. Luu  
Vice President of Engineering  
UltraTech Group of Labs

Date: October 5, 2020

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: October 5, 2020

Test Dates:  
September 15 - 24, 2020  
October 2, 2020

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- *This report must not be used by the client to claim product endorsement by any agency of the US Government.*
- *This test report shall not be reproduced, except in full, without a written approval from UltraTech*

## UltraTech

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1309



CA0001-2049



AT-1945



SL2-IN-E-1119R



Korea KCC-RRR

CA0001

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## EXHIBIT 1. INTRODUCTION

### 1.1. SCOPE

<b>Reference:</b>	FCC Parts 2 and 95
<b>Title:</b>	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2 & 95
<b>Purpose of Test:</b>	FCC Equipment Authorization Certification for Part 95 Subpart J – Multi-Use Radio Service (MURS) operating in the following frequencies: 151.820, 151.880, 151.940, 154.570, and 154.600 MHz
<b>Test Procedures:</b>	<ul style="list-style-type: none"><li>• ANSI C63.26-2015</li><li>• ANSI C63.4</li></ul>

### 1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

### 1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2019	Code of Federal Regulations, Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI/TIA-603-E	2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

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## ULTRATECH GROUP OF LABS

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File #: 20ICOM531\_FCC95J  
October 5, 2020

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

## EXHIBIT 2. PERFORMANCE ASSESSMENT

### 2.1. CLIENT INFORMATION

Applicant	
<b>Name:</b>	Icom Incorporated
<b>Address:</b>	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
<b>Contact Person:</b>	Mr. Atsushi Tomiyama Phone #: +81 6 6793 5302 Fax #: +81 6 6793 0013 Email Address: world_support@icom.co.jp

Manufacturer	
<b>Name:</b>	Icom Incorporated
<b>Address:</b>	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
<b>Contact Person:</b>	Mr. Atsushi Tomiyama Phone #: +81 6 6793 5302 Fax #: +81 6 6793 0013 Email Address: world_support@icom.co.jp

### 2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name:</b>	ICOM Incorporated
<b>Product Name:</b>	VHF Transceiver
<b>Model Name or Number:</b>	IC-V10MR
<b>Serial Number:</b>	00000010
<b>Type of Equipment:</b>	MURS
<b>Power Supply Requirement:</b>	7.5 VDC nominal
<b>Transmitting/Receiving Antenna Type:</b>	Non-Integral
<b>Primary User Functions of EUT:</b>	Two-way radio

**2.3. EUT'S TECHNICAL SPECIFICATIONS**

<b>Transmitter</b>	
<b>Equipment Type:</b>	Portable
<b>Intended Operating Environment:</b>	Commercial, industrial or business environment
<b>Power Supply Requirement:</b>	7.5 VDC nominal
<b>RF Output Power Rating:</b>	2 / 1 / 0.5 W
<b>Operating Frequency Range:</b>	151.820 - 151.940 MHz (Narrowband) 154.570 - 154.600 MHz (Wideband)
<b>RF Output Impedance:</b>	50 Ω
<b>Emission Bandwidth:</b>	Narrowband (12.5 kHz) for 151.820, 151.880 and 151.940 MHz Wideband (25.0 kHz) for 154.570, and 154.600 MHz
<b>Modulation Employed:</b>	FM
<b>Emission Designator*:</b>	11K0F3E (Narrowband) 16K0F3E (Wideband)
<b>Antenna Connector Type:</b>	Non-integral

\*For Typical Commercial Telephony:

$$B_n = 2M + 2DK, K = 1 \text{ and } M = 3 \text{ kHz (for an average case of commercial telephony)}$$

Where:

- B<sub>n</sub> = Necessary bandwidth (kHz)
- M = Maximum modulation frequency (kHz)
- D = Peak frequency deviation (kHz)
- K = Constant

MURS Authorized Bandwidth for Narrowband: 11.25 kHz (for 151.820, 151.880 and 151.940 MHz)

$$B_n = 2M + 2DK$$

$$B_n = (2 * 3) + (2 * 2.5 * 1)$$

$$B_n = 11.0$$

Emission Designator: 11K0F3E

MURS Authorized Bandwidth for Wideband: 20.00 kHz (for 154.570 and 154.600 MHz)

$$B_n = 2M + 2DK$$

$$B_n = (2 * 3) + (2 * 5 * 1)$$

$$B_n = 16.0$$

Emission Designator: 16K0F3E

**2.4. LIST OF EUT'S PORTS**

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Antenna Connector	1	Screw-type	Direct Connection
1	Speaker-Microphone Jack	1	2-pin Screw attached type; 3.5 mm Earphone jack	Non-shielded

**2.5. ANCILLARY EQUIPMENT**

Ancillary Equipment # 1	
Description:	Speaker Microphone
Brand name:	Icom
Model Name or Number:	HM-159LA
Connected to EUT's Port:	Speaker-Microphone Jack

**EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS**

**3.1. CLIMATE TEST CONDITIONS**

The climate conditions of the test environment are as follows:

Temperature:	21°C - 24°C
Humidity:	45% to 58%
Pressure:	102 kPa
Power input source:	7.5 VDC

**3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS**

<b>Operating Modes:</b>	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
<b>Special Test Software:</b>	N/A
<b>Special Hardware Used:</b>	N/A
<b>Transmitter Test Antenna:</b>	The EUT is tested with the transmitter antenna port terminated to a 50 Ω Load.

<b>Transmitter Test Signals</b>	
<b>Frequency Band(s):</b>	151.820 - 151.940 MHz 154.570 - 154.600 MHz
<b>Test Frequency(ies):</b>	151.820, 151.880 and 151.940 MHz 154.570, and 154.600 MHz
<b>Transmitter Wanted Output Test Signals:</b>	
<ul style="list-style-type: none"> <li>• Transmitter Power (measured maximum output power):</li> <li>• Normal Test Modulation:</li> <li>• Modulating signal source:</li> </ul>	<p>32.92 dBm (1.96 W)</p> <p>FM Voice</p> <p>External</p>

## EXHIBIT 4. SUMMARY OF TEST RESULTS

### 4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

### 4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
2.1046 & 95.2767	RF Power Output	Yes
2.1047(a) & 95.2775	Modulation Characteristics - Audio Frequency Response	Yes
2.1047(b)	Modulation Characteristics - Modulation Limiting	Yes
2.1049, 95.2773 & 95.2779	Occupied Bandwidth and Emission Masks	Yes
2.1051, 2.1057 & 95.2779(b)	Spurious Emissions at Antenna Terminals	Yes
2.1053, 2.1057 & 95.2779(b)	Field Strength of Spurious Radiation	Yes
2.1055 & 95.2765	Frequency Stability	Yes
1.1307, 1.1310 & 2.1093	Radiofrequency Radiation Exposure Evaluation	Yes

### 4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

### 4.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

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#### ULTRATECH GROUP OF LABS

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File #: 20ICOM531\_FCC95J  
October 5, 2020

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)



## EXHIBIT 5. TEST DATA

### 5.1. RF POWER OUTPUT [§§ 2.1046 & 95.2767]

#### 5.1.1. Limits

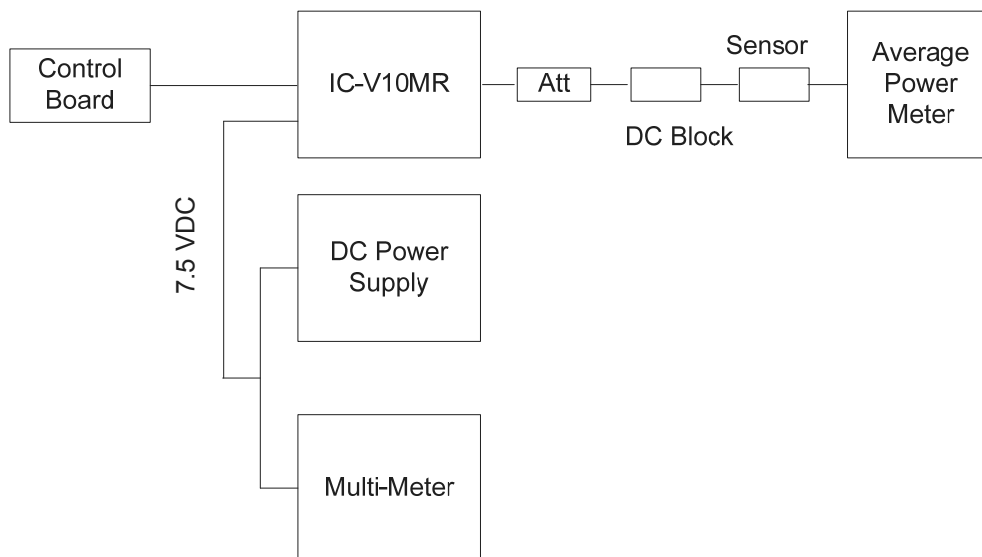
§95.2767 MURS transmitting power limit.

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

#### 5.1.2. Method of Measurements

ANSI C63.26 Section 5.2.

#### 5.1.3. Test Arrangement



5.1.4. Test Data

CH no.	Frequency (MHz)	Emission Bandwidth (Wide/Narrow)	Rated Output Power (W)	Measured Output Power		Limit (W)	Margin (W)
				(dBm)	(W)		
5	151.820	Narrow	2.0	32.92	1.96	2	-0.04
13	151.820	Narrow	1.0	30.17	1.04	2	-0.96
6	151.820	Narrow	0.5	27.09	0.51	2	-1.49
1	151.880	Narrow	2.0	32.82	1.91	2	-0.09
11	151.880	Narrow	1.0	30.17	1.04	2	-0.96
2	151.880	Narrow	0.5	26.99	0.50	2	-1.50
7	151.940	Narrow	2.0	32.89	1.95	2	-0.05
14	151.940	Narrow	1.0	30.17	1.04	2	-0.96
8	151.940	Narrow	0.5	27.05	0.51	2	-1.49
3	154.570	Wide	2.0	32.87	1.94	2	-0.06
12	154.570	Wide	1.0	30.11	1.03	2	-0.97
4	154.570	Wide	0.5	26.94	0.49	2	-1.51
9	154.600	Wide	2.0	32.87	1.94	2	-0.06
15	154.600	Wide	1.0	29.66	0.92	2	-1.08
10	154.600	Wide	0.5	26.96	0.50	2	-1.50

## 5.2. MODULATION CHARACTERISTICS – AUDIO FREQUENCY RESPONSE [§§ 2.1047(a) & 95.2775]

### 5.2.1. Limits

§95.2775 MURS audio filter.

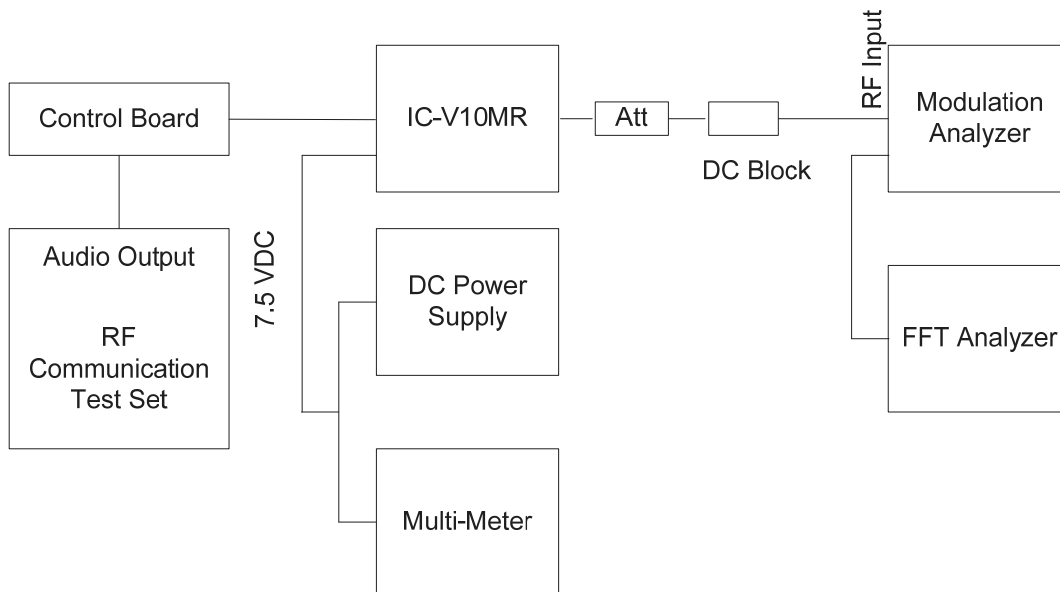
(a) The audio filter must be between the modulation limiter and the modulated stage of the transmitter.

(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.

### 5.2.2. Method of Measurements

The rated audio input signal was applied to the input of the audio lowpass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT (Audio) spectrum analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 kHz.

### 5.2.3. Test Arrangement



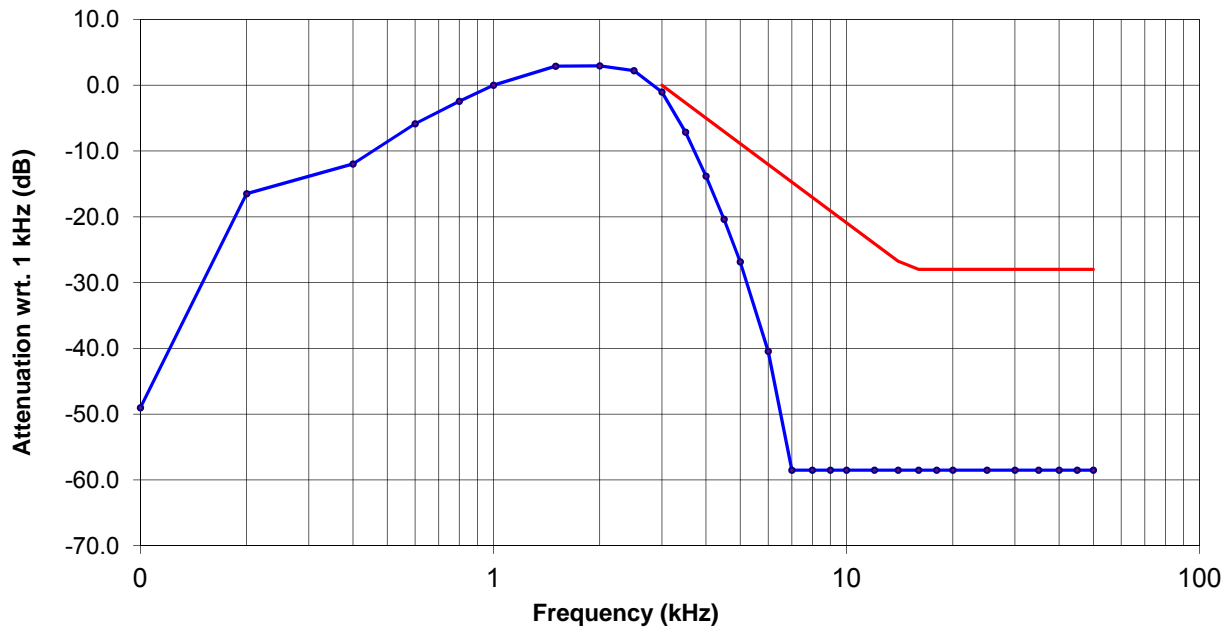
**5.2.4. Test Data**

**Remark:** Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the frequency response of all modulation states was performed to show the roll-off at 3 kHz in comparison with FCC Limit for audio low-pass filter.

**5.2.4.1. Audio Frequency Response of All Modulation States for Narrowband (12.5 kHz)**

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	§95.2775(b) Limit (dB)
0.1	-36.65	-50.51	-13.9	-49.0	--
0.2	-36.65	-17.98	18.7	-16.5	--
0.4	-36.65	-13.46	23.2	-12.0	--
0.6	-36.65	-7.35	29.3	-5.9	--
0.8	-36.65	-3.93	32.7	-2.4	--
1.0	-36.65	-1.49	35.2	0.0	--
1.5	-36.65	1.40	38.1	2.9	--
2.0	-36.65	1.46	38.1	3.0	--
2.5	-36.65	0.72	37.4	2.2	--
3.0	-36.65	-2.52	34.1	-1.0	0
3.5	-36.65	-8.62	28.0	-7.1	-3
4.0	-36.65	-15.31	21.3	-13.8	-5
4.5	-36.65	-21.86	14.8	-20.4	-7
5.0	-36.65	-28.33	8.3	-26.8	-9
6.0	-36.65	-41.93	-5.3	-40.4	-12
7.0	-36.65	-60.00	-23.4	-58.5	-15
8.0	-36.65	-60.00	-23.4	-58.5	-17
9.0	-36.65	-60.00	-23.4	-58.5	-19
10.0	-36.65	-60.00	-23.4	-58.5	-21
12.0	-36.65	-60.00	-23.4	-58.5	-24
14.0	-36.65	-60.00	-23.4	-58.5	-27
16.0	-36.65	-60.00	-23.4	-58.5	-28
18.0	-36.65	-60.00	-23.4	-58.5	-28
20.0	-36.65	-60.00	-23.4	-58.5	-28
25.0	-36.65	-60.00	-23.4	-58.5	-28
30.0	-36.65	-60.00	-23.4	-58.5	-28
35.0	-36.65	-60.00	-23.4	-58.5	-28
40.0	-36.65	-60.00	-23.4	-58.5	-28
45.0	-36.65	-60.00	-23.4	-58.5	-28
50.0	-36.65	-60.00	-23.4	-58.5	-28

§95.2775(b)  
Audio Frequency Response  
Narrowband (12.5 kHz)



5.2.4.2. Audio Frequency Response of All Modulation States for Wideband (25 kHz)

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	§95.2775(b) Limit (dB)
0.1	-36.65	-54.00	-17.4	-58.5	--
0.2	-36.65	-12.04	24.6	-16.5	--
0.4	-36.65	-7.37	29.3	-11.8	--
0.6	-36.65	-1.51	35.1	-6.0	--
0.8	-36.65	1.97	38.6	-2.5	--
1.0	-36.65	4.45	41.1	0.0	--
1.5	-36.65	7.61	44.3	3.2	--
2.0	-36.65	7.63	44.3	3.2	--
2.5	-36.65	7.25	43.9	2.8	--
3.0	-36.65	3.95	40.6	-0.5	0
3.5	-36.65	0.25	36.9	-4.2	-3
4.0	-36.65	-5.99	30.7	-10.4	-5
4.5	-36.65	-14.99	21.7	-19.4	-7
5.0	-36.65	-23.59	13.1	-28.0	-9
6.0	-36.65	-39.27	-2.6	-43.7	-12
7.0	-36.65	-60.00	-23.4	-64.5	-15
8.0	-36.65	-60.00	-23.4	-64.5	-17
9.0	-36.65	-60.00	-23.4	-64.5	-19
10.0	-36.65	-60.00	-23.4	-64.5	-21
12.0	-36.65	-60.00	-23.4	-64.5	-24
14.0	-36.65	-60.00	-23.4	-64.5	-27
16.0	-36.65	-60.00	-23.4	-64.5	-28
18.0	-36.65	-60.00	-23.4	-64.5	-28
20.0	-36.65	-60.00	-23.4	-64.5	-28
25.0	-36.65	-60.00	-23.4	-64.5	-28
30.0	-36.65	-60.00	-23.4	-64.5	-28
35.0	-36.65	-60.00	-23.4	-64.5	-28
40.0	-36.65	-60.00	-23.4	-64.5	-28
45.0	-36.65	-60.00	-23.4	-64.5	-28
50.0	-36.65	-60.00	-23.4	-64.5	-28

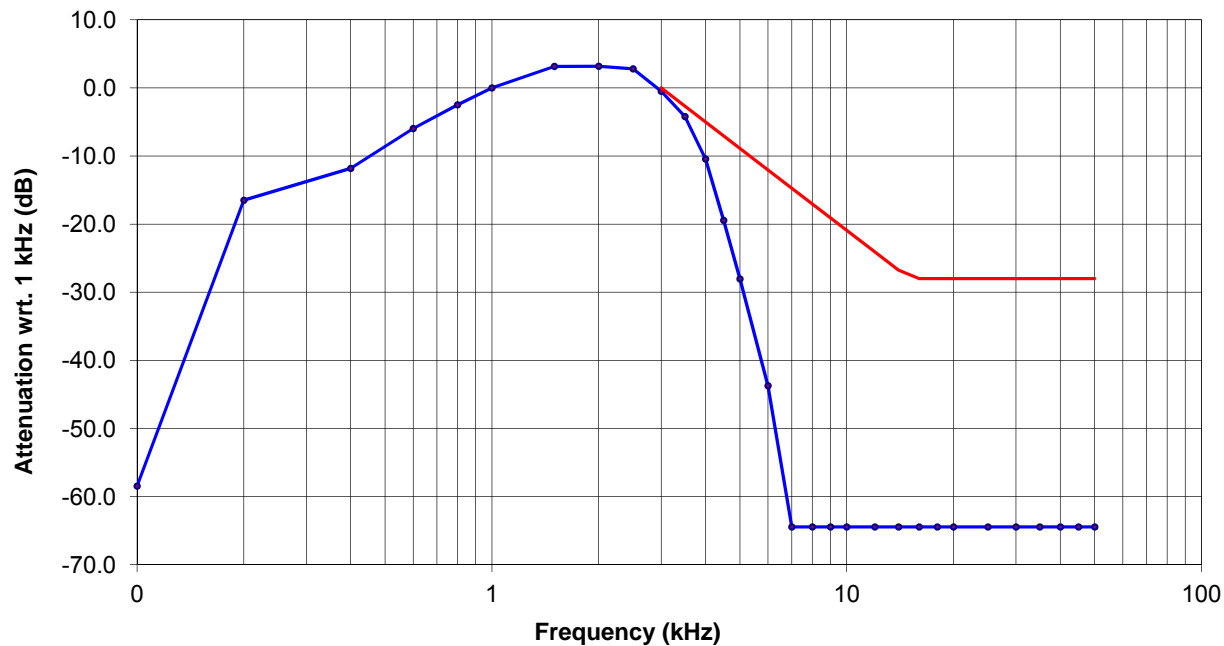
**ULTRATECH GROUP OF LABS**

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File #: 20ICOM531\_FCC95J  
October 5, 2020

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

§95.2775(b)  
Audio Frequency Response  
Wideband (25 kHz)



### 5.3. MODULATION CHARACTERISTICS – MODULATION LIMITING [§2.1047(a)]

#### 5.3.1. Limits

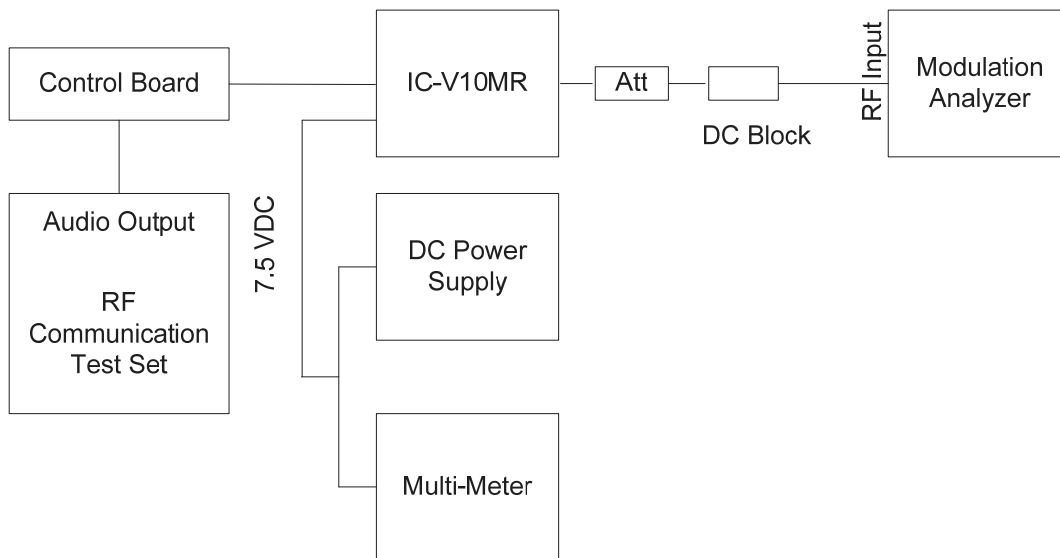
**§2.1047(a)** *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

#### 5.3.2. Method of Measurements

**For Audio Transmitter:-** The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

**For Data Transmitter with Maximum Frequency Deviation set by Factory:** The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

#### 5.3.3. Test Arrangement





5.3.4. Test Data

5.3.4.1. Modulation Limiting for Narrowband (12.5 kHz)

Modulating Signal Level (mVrms)	Peak Modulation Deviation (kHz)					Maximum Limit (kHz)
	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	
1	0.03	0.05	0.11	0.15	0.03	2.5
2	0.03	0.09	0.19	0.28	0.04	2.5
4	0.03	0.15	0.36	0.54	0.05	2.5
6	0.03	0.22	0.53	0.79	0.05	2.5
8	0.03	0.29	0.70	1.03	0.07	2.5
10	0.03	0.34	0.84	1.08	0.07	2.5
15	0.03	0.49	1.25	1.13	0.09	2.5
20	0.03	0.66	1.69	1.14	0.09	2.5
25	0.03	0.82	1.82	1.14	0.09	2.5
30	0.03	0.97	1.86	1.15	0.09	2.5
35	0.03	1.13	1.91	1.16	0.09	2.5
40	0.03	1.28	1.94	1.16	0.09	2.5
45	0.03	1.44	1.95	1.16	0.11	2.5
50	0.03	1.59	1.97	1.16	0.12	2.5
60	0.03	1.78	1.98	1.17	0.14	2.5
70	0.03	1.82	2.00	1.17	0.14	2.5
80	0.03	1.83	2.03	1.18	0.15	2.5
90	0.03	1.84	2.03	1.17	0.15	2.5
100	0.03	1.87	2.03	1.18	0.15	2.5

Remarks		
Standard Modulation Level: 14.7 mV = 23.35 dB (mVrms) Voice Signal Input Level: Standard Modulation Level + 16 dB = 23.35 dB (mVrms) + 16 dB = 39.35 dB (mVrms) = 92.79 mVrms		
Modulation Frequency (kHz)	Peak Depth (kHz)	Maximum Limit (kHz)
0.1	0.03	2.5
0.2	0.03	2.5
0.4	1.80	2.5
0.6	1.93	2.5
0.8	2.02	2.5
1.0	2.02	2.5
1.2	1.96	2.5
1.4	1.96	2.5
1.6	1.95	2.5
1.8	1.92	2.5
2.0	1.88	2.5
2.5	1.71	2.5
3.0	1.18	2.5
3.5	0.62	2.5
4.0	0.33	2.5
4.5	0.21	2.5
5.0	0.15	2.5
6.0	0.09	2.5
7.0	0.06	2.5
8.0	0.10	2.5
9.0	0.04	2.5
10.0	0.03	2.5

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5.3.4.2. Modulation Limiting for Wideband (25 kHz)

Modulating Signal Level (mVrms)	Peak Modulation Deviation (kHz)					Maximum Limit (kHz)
	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	
1	0.04	0.09	0.21	0.38	0.04	5.0
2	0.04	0.16	0.37	0.73	0.05	5.0
4	0.04	0.28	0.71	1.43	0.07	5.0
6	0.04	0.41	1.05	2.12	0.09	5.0
8	0.04	0.54	1.41	2.77	0.10	5.0
10	0.04	0.66	1.69	2.88	0.11	5.0
15	0.04	0.97	2.53	2.98	0.14	5.0
20	0.04	1.30	3.41	3.00	0.14	5.0
25	0.04	1.61	3.61	3.00	0.18	5.0
30	0.04	1.92	3.72	3.03	0.18	5.0
35	0.04	2.24	3.79	3.03	0.18	5.0
40	0.04	2.55	3.85	3.03	0.18	5.0
45	0.04	2.86	3.89	3.03	0.18	5.0
50	0.04	3.19	3.92	3.03	0.22	5.0
60	0.04	3.53	3.96	3.06	0.24	5.0
70	0.04	3.60	3.98	3.07	0.26	5.0
80	0.04	3.66	4.02	3.07	0.26	5.0
90	0.04	3.69	4.02	3.07	0.28	5.0
100	0.04	3.75	4.02	3.08	0.31	5.0

Remarks		
Standard Modulation Level: 14.7 mV = 23.35 dB (mVrms) Voice Signal Input Level: Standard Modulation Level + 16 dB = 23.35 dB (mVrms) + 16 dB = 39.35 dB (mVrms) = 92.79 mVrms		
Modulation Frequency (kHz)	Peak Depth (kHz)	Maximum Limit (kHz)
0.1	0.04	5.0
0.2	0.04	5.0
0.4	3.58	5.0
0.6	3.82	5.0
0.8	3.99	5.0
1.0	4.02	5.0
1.2	3.95	5.0
1.4	3.89	5.0
1.6	3.88	5.0
1.8	3.82	5.0
2.0	3.77	5.0
2.5	3.53	5.0
3.0	3.07	5.0
3.5	1.89	5.0
4.0	0.89	5.0
4.5	0.44	5.0
5.0	0.29	5.0
6.0	0.18	5.0
7.0	0.11	5.0
8.0	0.10	5.0
9.0	0.05	5.0
10.0	0.04	5.0

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**5.4. OCCUPIED BANDWIDTH AND EMISSION MASKS [§§ 2.1049, 95.2773 & 95.2779]**

**5.4.1. Limits**

**§95.2773 MURS authorized bandwidths.**

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.

**§95.2779 MURS unwanted emissions limits.**

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.

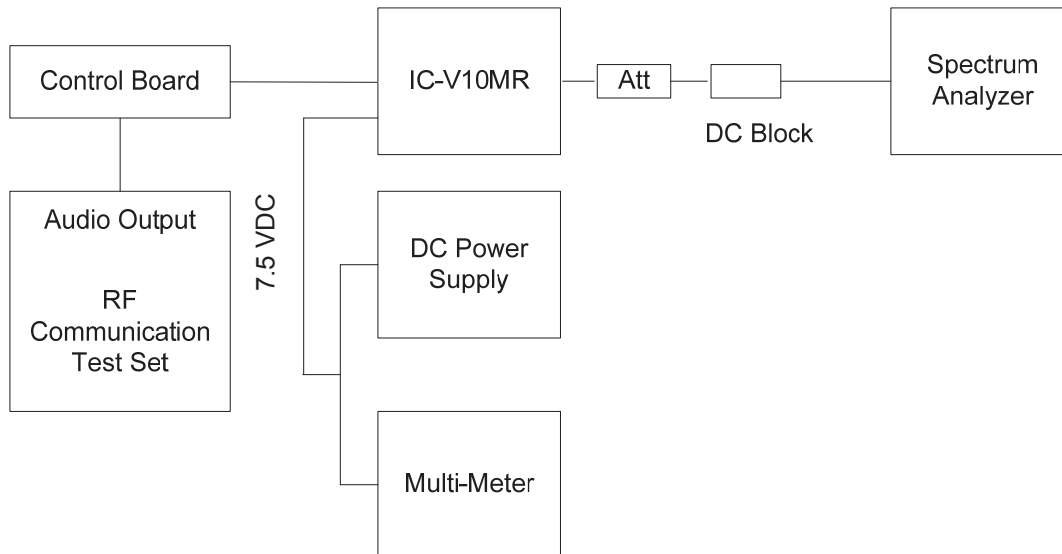
(b) *Attenuation requirements.* The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least:

- (1)  $7.27(f_d - 2.88)$  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)  $29 \log(f_d^2 \div 11)$  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.

#### 5.4.2. Method of Measurements

47 CFR 2.1049 and ANSI C63.26 Sections 5.4 and 5.7.

#### 5.4.3. Test Arrangement



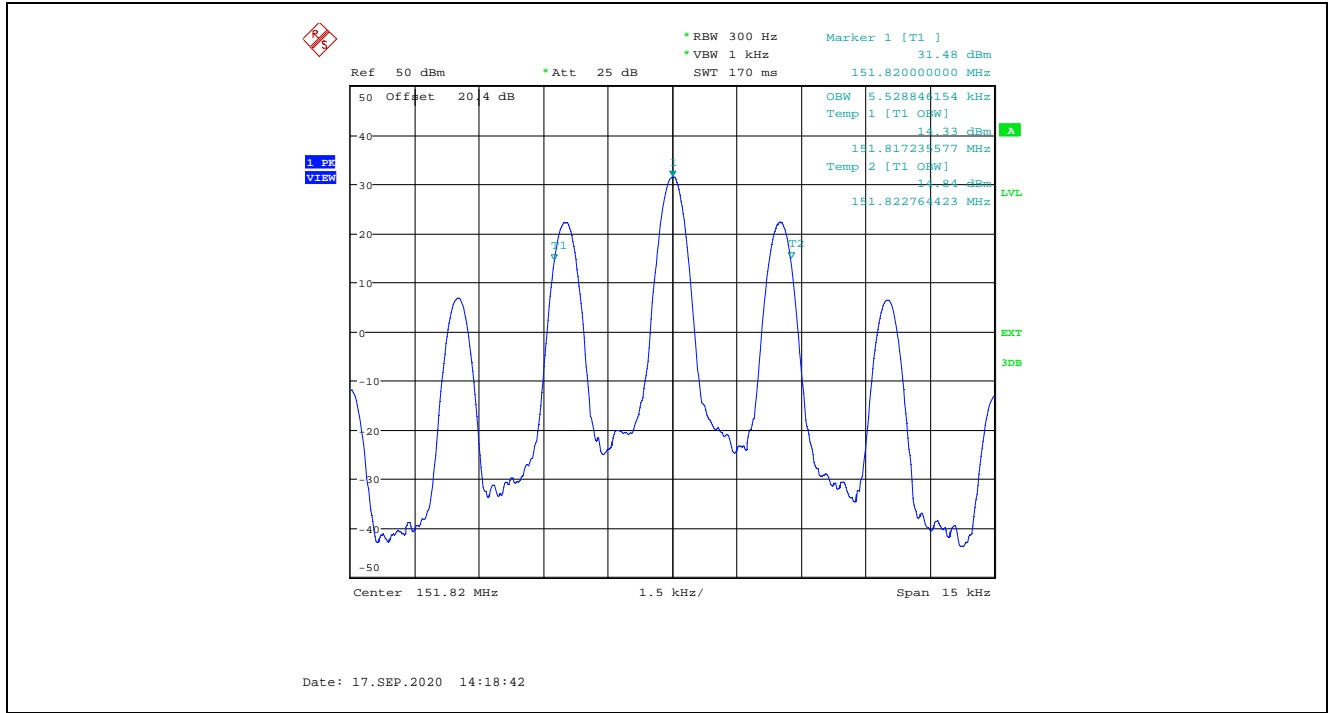
5.4.4. Test Data

5.4.4.1. 99% Occupied Bandwidth

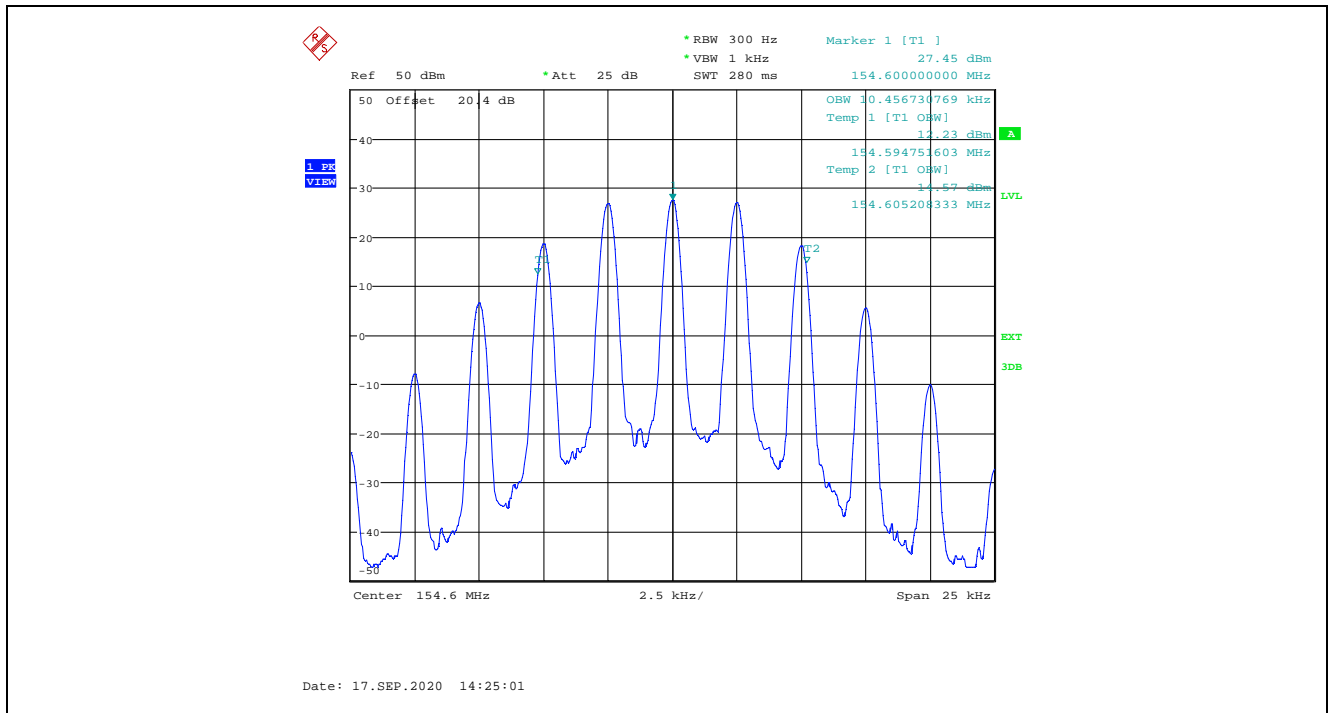
Channel	Emission Bandwidth (Narrowband/Wideband)	Frequency (MHz)	99% Occupied Bandwidth (kHz)
3	Narrowband	151.820	5.53
9	Wideband	154.600	10.46

\* See the following plots for details of measurements

Plot 5.4.4.1.1. 99% Occupied Bandwidth, Ch 3, 151.820 MHz, Narrowband



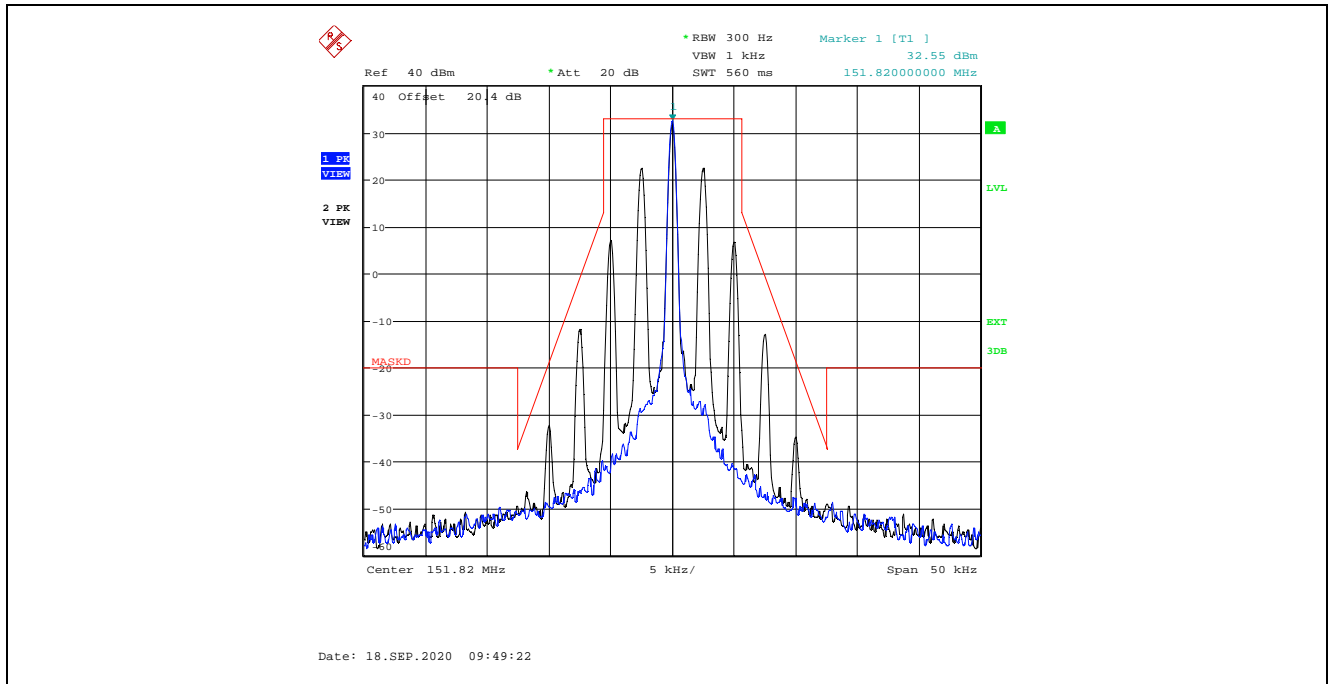
Plot 5.4.4.1.2. 99% Occupied Bandwidth, Ch 9, 154.600 MHz, Wideband



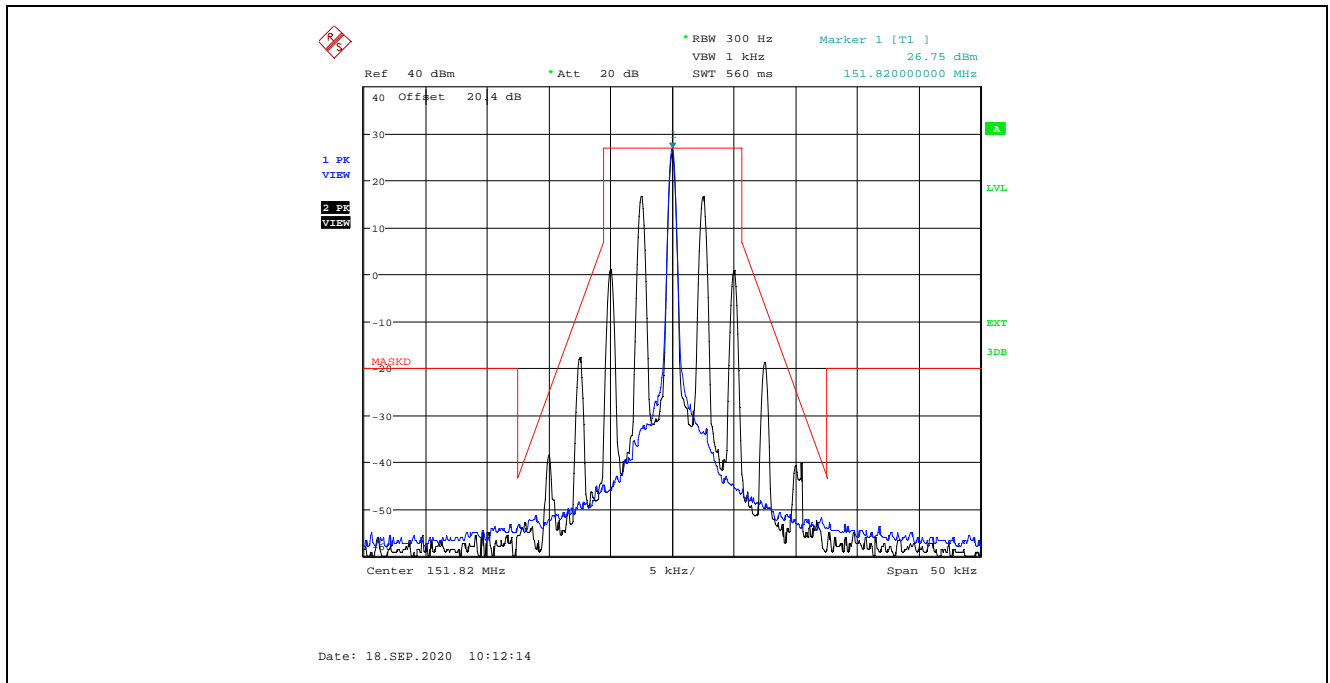


5.4.4.2. Emission Mask

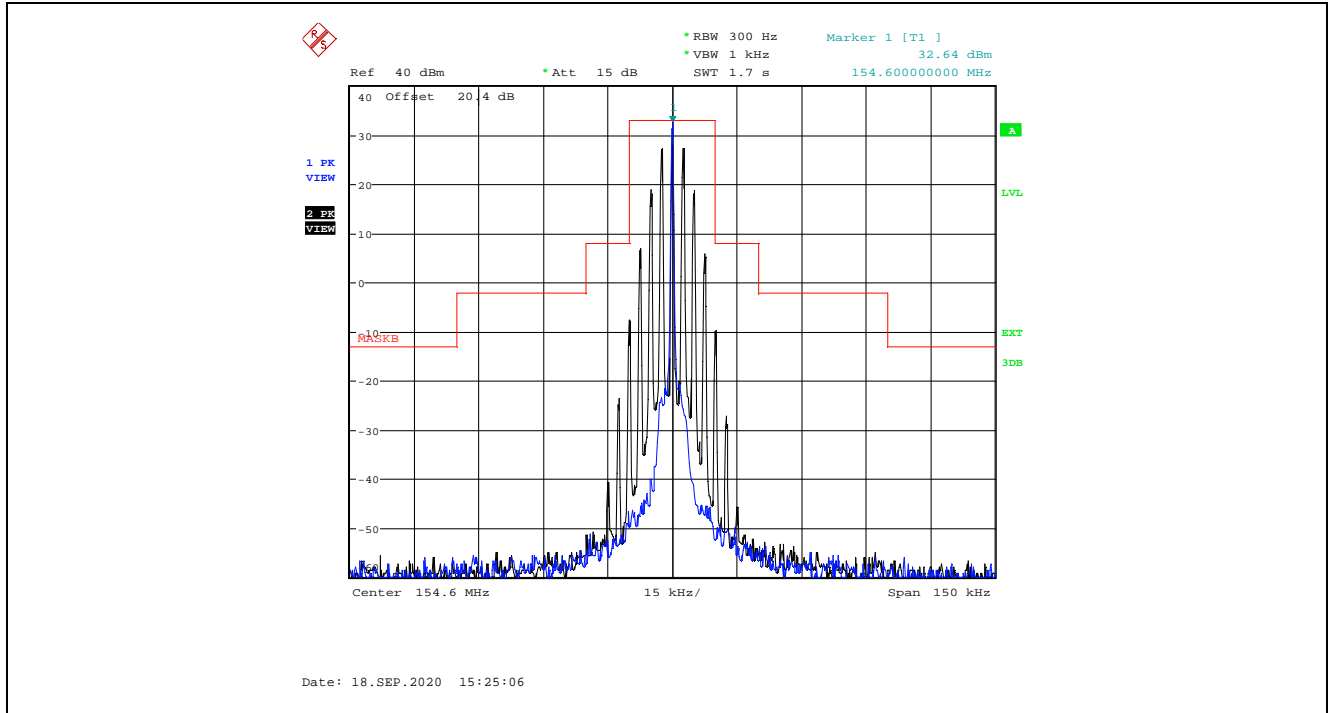
Plot 5.4.4.2.1. Emissions Mask [(b)(1),(2)], Ch 5, 151.820 MHz, Narrowband, High Power



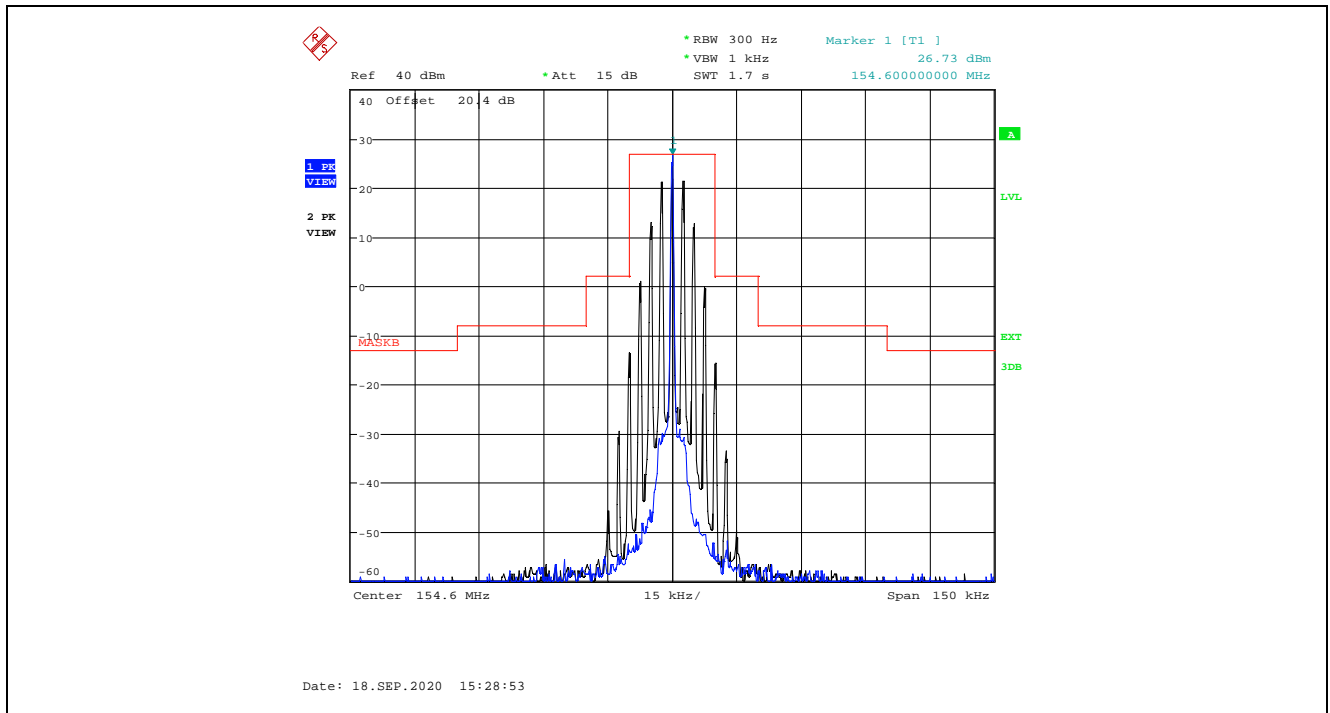
Plot 5.4.4.2.2. Emissions Mask [(b)(1),(2)], Ch 6, 151.820 MHz, Narrowband, Low Power



Plot 5.4.4.2.3. Emissions Mask [(b)(3),(4),(7)], Ch 9, 154.600 MHz, Wideband, High Power



Plot 5.4.4.2.4. Emissions Mask [(b)(3),(4),(7)], Ch 10, 154.600 MHz, Wideband, Low Power



**5.5. TRANSMITTER SPURIOUS EMISSIONS AT ANTENNA TERMINALS [§§ 2.1053, 95.2779]**

**5.5.1. Limits**

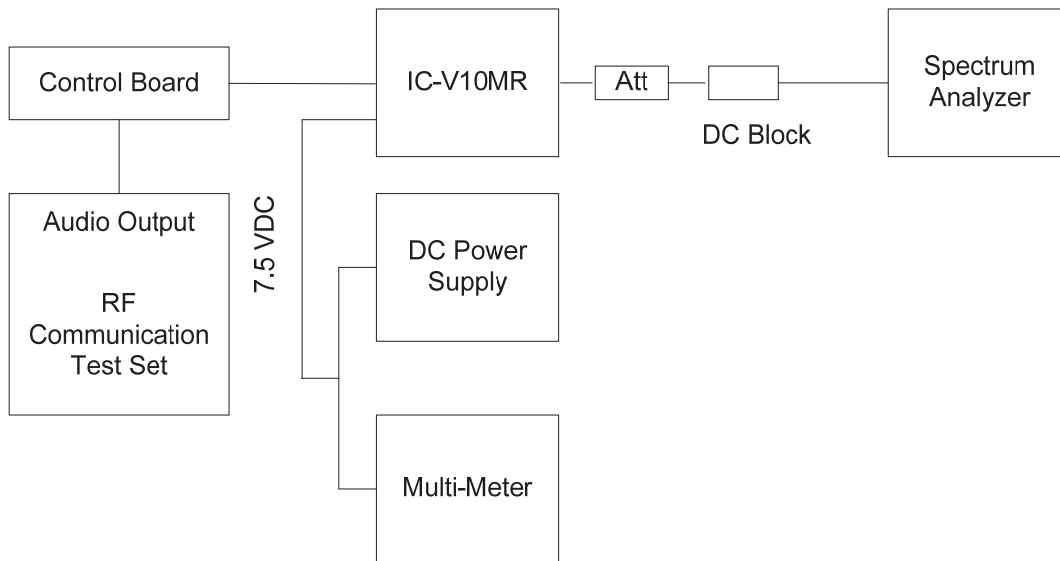
§95.2779(b) The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least in the following table.

Channel center frequencies (MHz)	Attenuation
151.820, 151.880 and 151.940	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
154.570 & 154.600,	43 + 10 log(P) dB on any frequency removed from the channel center frequency by more than 50 kHz.

**5.5.2. Method of Measurements**

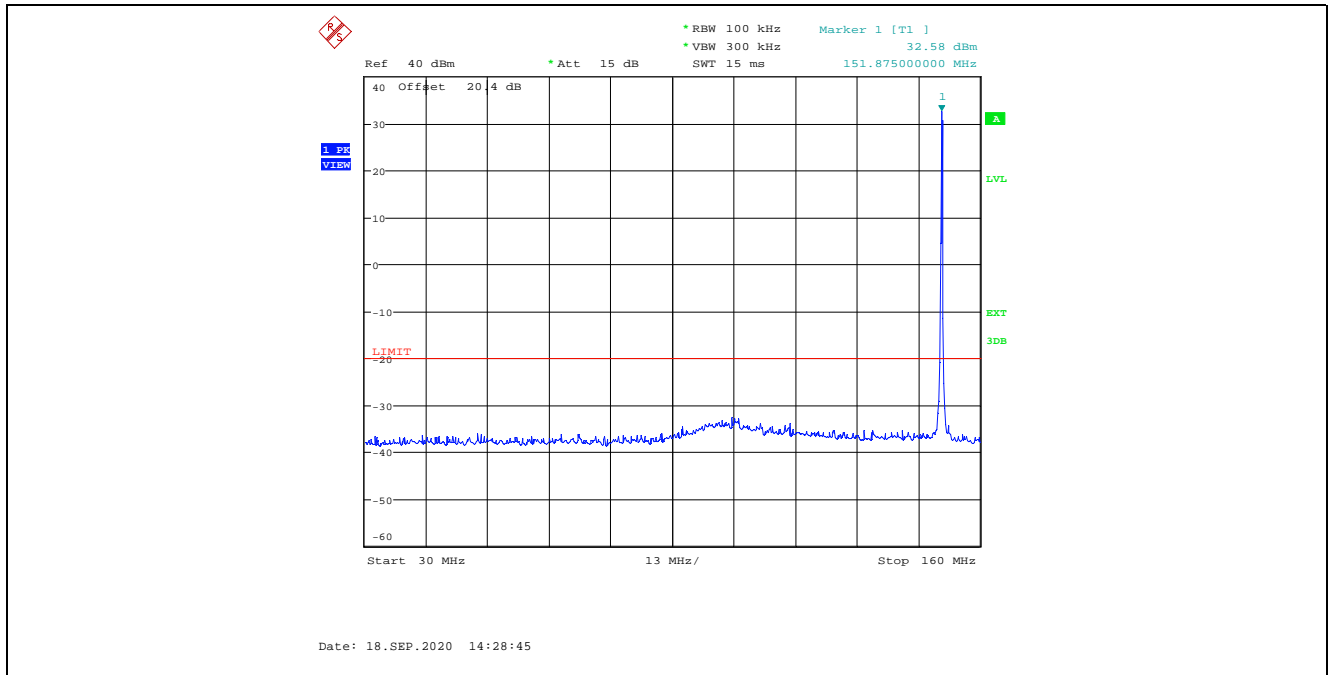
ANSI C63.26 Section 5.7.

**5.5.3. Test Arrangement**

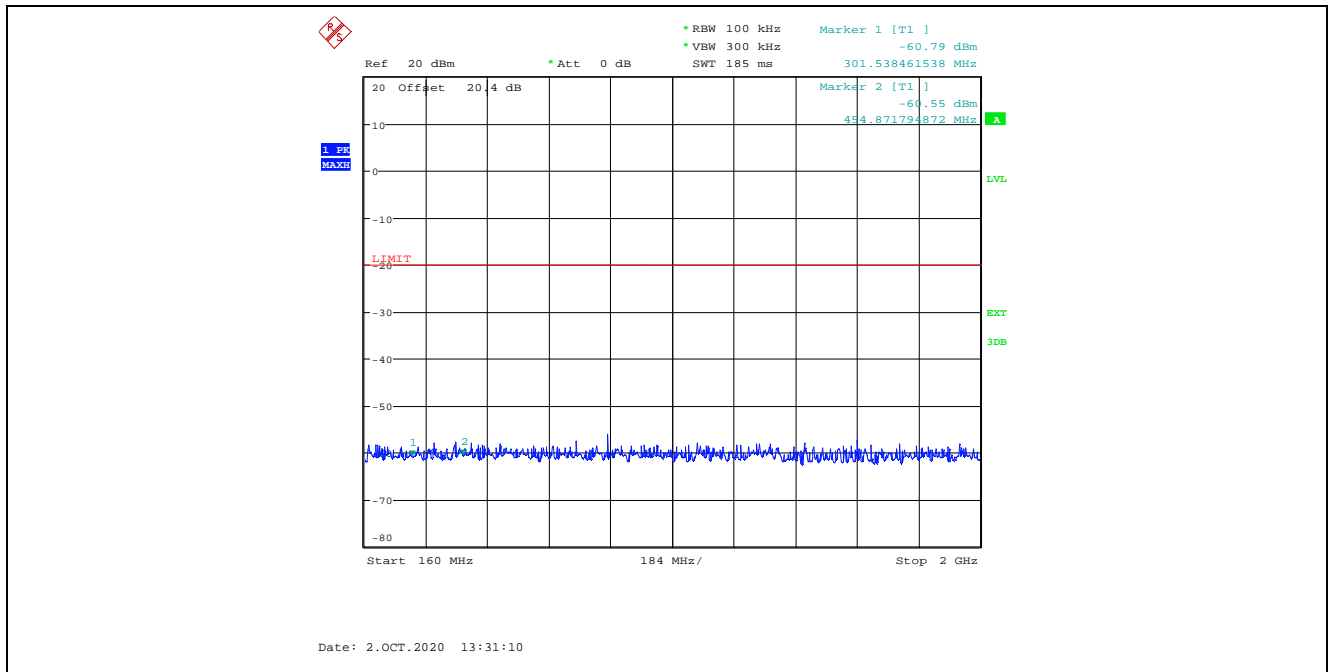


5.5.4. Test Data

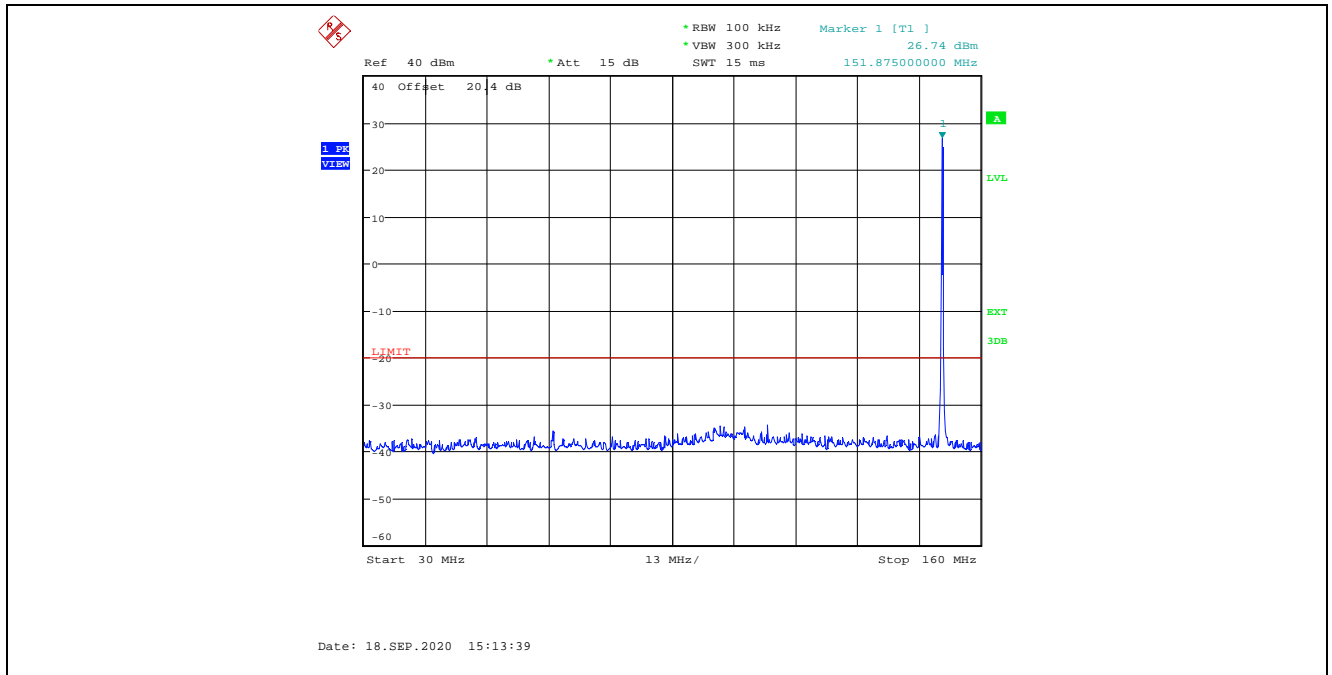
Plot 5.5.4.1. Transmitter Spurious Emissions at Antenna Terminal, Ch 5, 151.820 MHz, High Power  
30 – 160 MHz



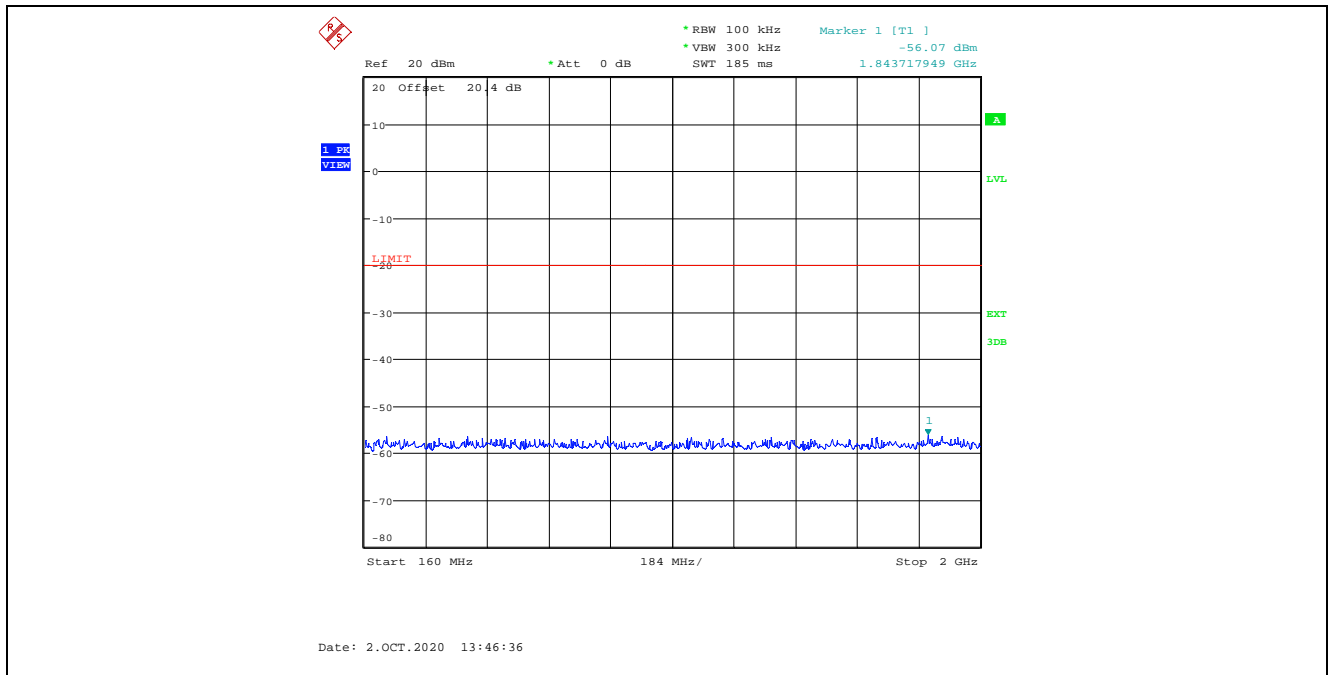
Plot 5.5.4.2. Transmitter Spurious Emissions at Antenna Terminal, Ch 5, 151.820 MHz, High Power  
160 MHz – 2 GHz



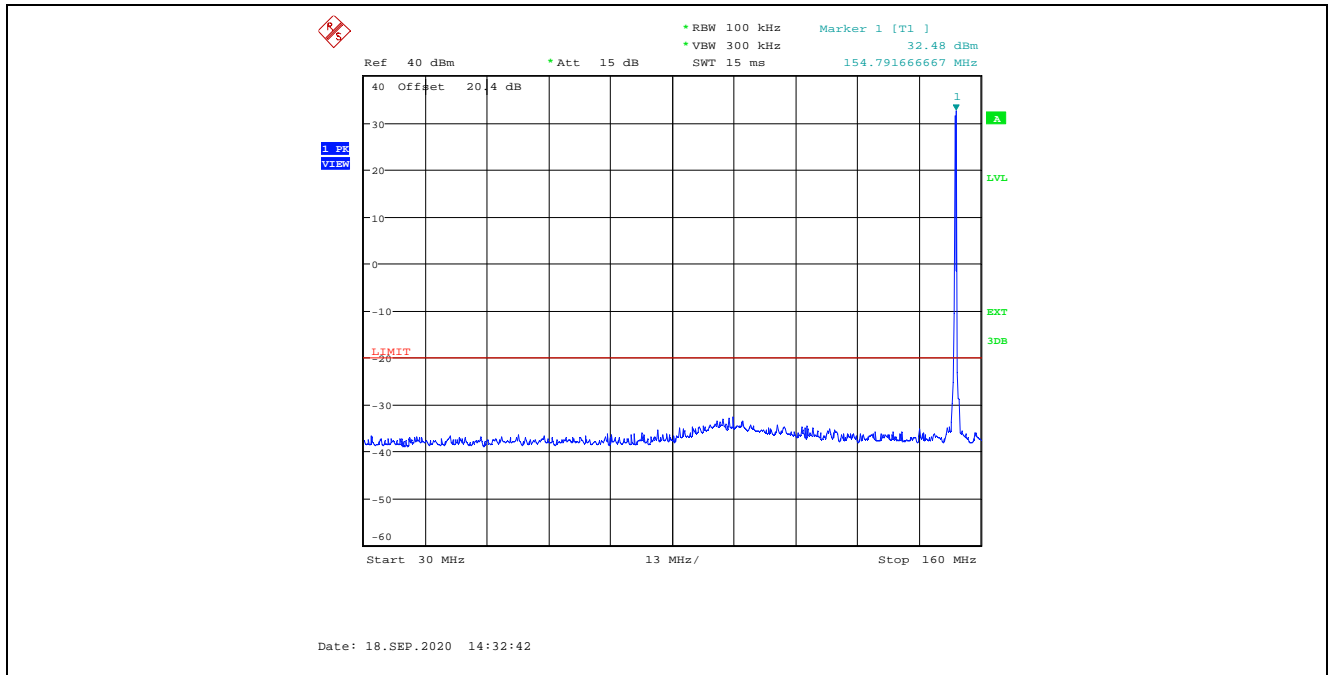
**Plot 5.5.4.3.** Transmitter Spurious Emissions at Antenna Terminal, Ch 6, 151.820 MHz, Low Power  
 30 – 160 MHz



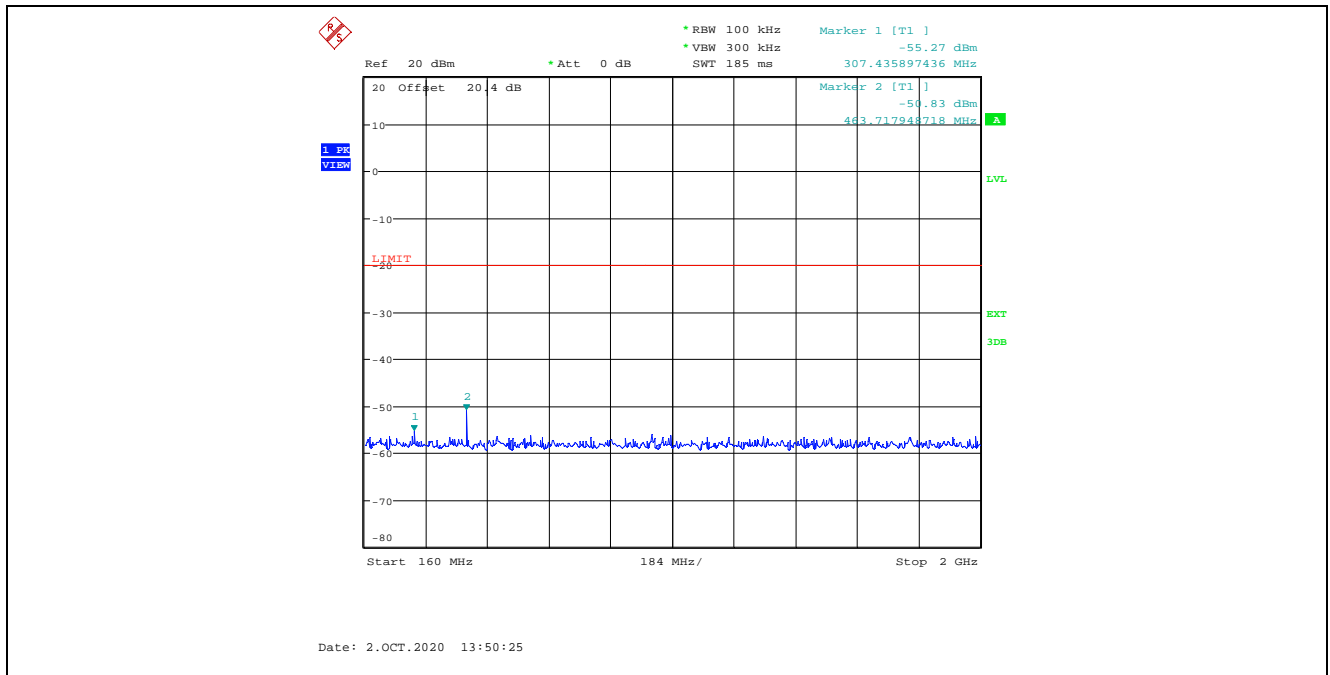
**Plot 5.5.4.4.** Transmitter Spurious Emissions at Antenna Terminal, Ch 6, 151.820 MHz, Low Power  
 160 MHz – 2 GHz



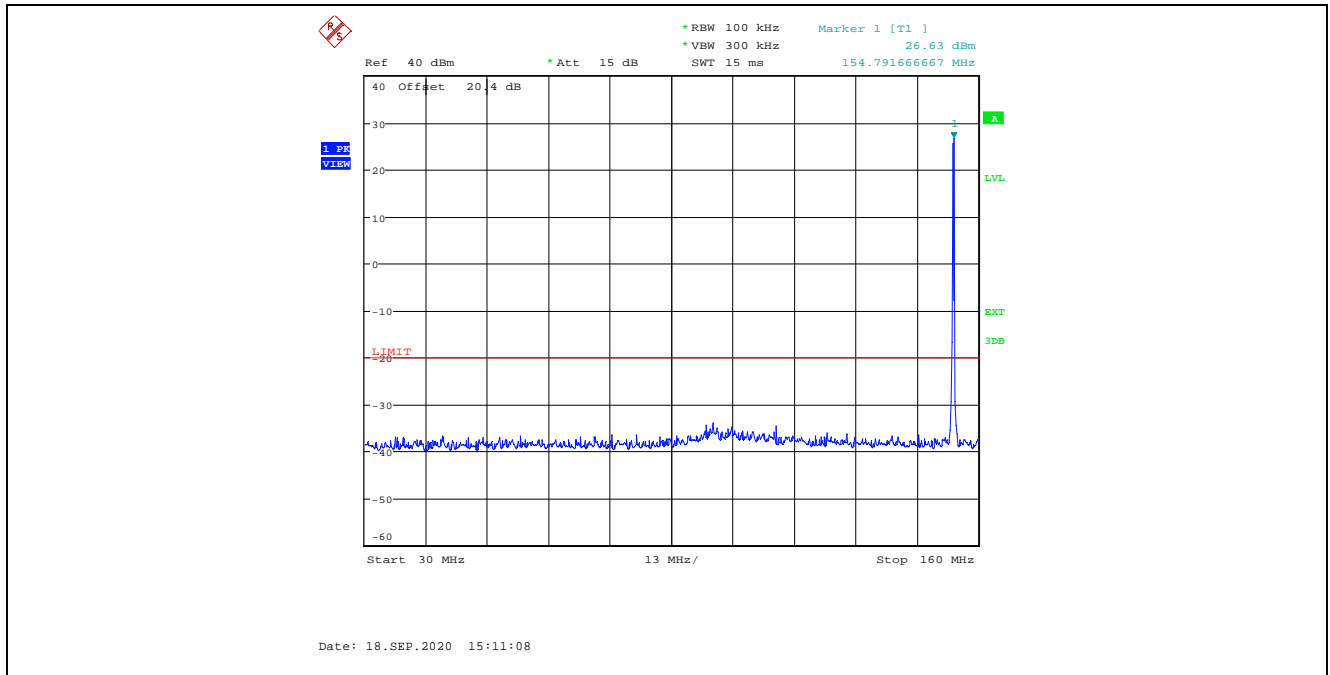
Plot 5.5.4.5. Transmitter Spurious Emissions at Antenna Terminal, Ch 9, 154.600 MHz, High Power  
30 – 160 MHz



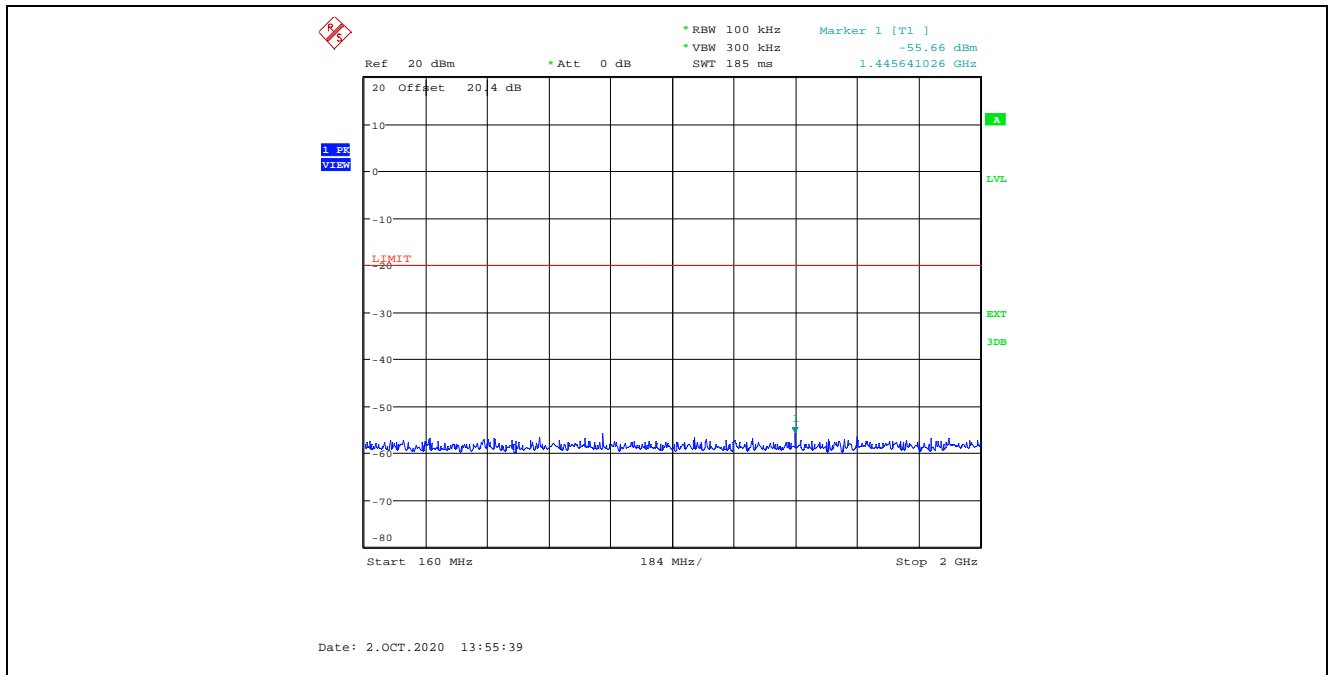
Plot 5.5.4.6. Transmitter Spurious Emissions at Antenna Terminal, Ch 9, 154.600 MHz, High Power  
160 MHz – 2 GHz



Plot 5.5.4.7. Transmitter Spurious Emissions at Antenna Terminal, Ch 10, 154.600 MHz, Low Power  
30 – 160 MHz



Plot 5.5.4.8. Transmitter Spurious Emissions at Antenna Terminal, Ch 10, 154.600 MHz, Low Power  
160 MHz – 2 GHz



**5.6. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS [§§ 2.1053 & 95.2779(b)]**

**5.6.1. Limits**

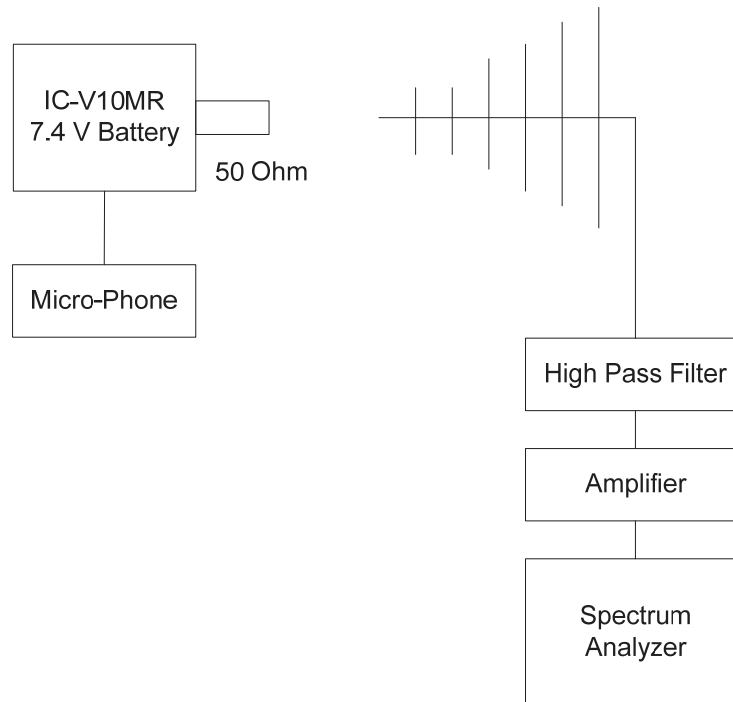
§95.2779(b) The power of unwanted emissions must be attenuated below the transmitter output power in Watts (P) by at least in the following table.

Channel center frequencies (MHz)	Attenuation
151.820, 151.880 and 151.940	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
154.570 & 154.600,	43 + 10 log (P) dB on any frequency removed from the channel center frequency by more than 50 kHz.

**5.6.2. Method of Measurements**

ANSI C63.26 Section 5.5.

**5.6.3. Test Arrangement**





5.6.4. Test Data

Remark(s):

- The emissions were scanned from 30 MHz to 2 GHz; all spurious emissions that are in excess of 20dB below the specified limit shall be recorded.
- The most stringent limit shall be applied for compliance.

<b>Carrier Frequency:</b>		151.820 MHz						
<b>Limit:</b>		-20 dBm						
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP/Avg)	Antenna Polarization (V/H)	Power from Signal Gen. (dBm)	Subs. Horn Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Spurious emissions are more than 20 dB below the applicable limit.								

<b>Carrier Frequency:</b>		154.600 MHz						
<b>Limit:</b>		-20 dBm						
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP/Avg)	Antenna Polarization (V/H)	Power from Signal Gen. (dBm)	Subs. Horn Ant. Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Spurious emissions are more than 20 dB below the applicable limit.								

## 5.7. FREQUENCY STABILITY [§§ 2.1055 & 95.2765]

### 5.7.1. Limits

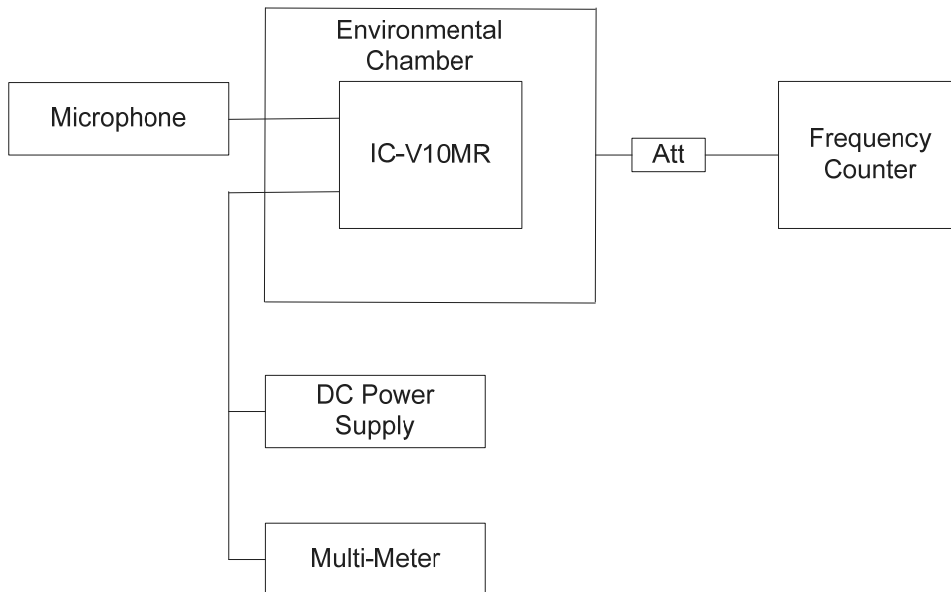
Each MURS transmitter type must be designed to meet the applicable frequency tolerance and stability requirements of this section.

- (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.

### 5.7.2. Method of Measurements

ANSI C63.26 Section 5.6.

### 5.7.3. Test Arrangement



5.7.4. Test Data

<b>Center Frequency:</b>	151.820 MHz		
<b>Full Power Level:</b>	2 W		
<b>Frequency Tolerance Limit (Worst Case):</b>	5 ppm or 759 Hz (Manufacturer's rating: $\pm$ 5 ppm)		
<b>Max. Frequency Tolerance Measured:</b>	1.53 ppm or -232 Hz		
<b>Input Voltage Rating:</b>	7.5 VDC		
Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 7.5 VDC	Supply Voltage (85% of 13.8 VDC) 6.375 VDC	Supply Voltage (115% of 28 VDC) 8.625 VDC
-30	-2	--	--
-20	+34	--	--
-10	+34	--	--
0	+31	--	--
+10	+24	--	--
+20	-7	-8	-17
+30	-16	--	--
+40	-232	--	--
+50	-65	--	--
+60	-64	--	--

**EXHIBIT 6. TEST EQUIPMENT LIST**

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Power Meter	Hewlett Packard	436A	2016A07747	100 kHz sensor dependent	14 Apr 2021
Power Sensor	Agilent	8482A	MY44175182	100 kHz – 4.2 GHz	15 Nov 2020
Attenuator (20dB)	Weinschel	46-20-34	BM1347	DC – 18 GHz	See Note 1
DC Block	Hewlett Packard	11742A	12460	0.045 – 26.5 GHz	See Note 1
DC Power Supply	HQ Power	PS613U	NSN	0 – 30V 3A	See Note 1
Multi-meter	Fluke	8842A	4142055	20mV - 1kV	17 May 2021
Modulation Analyzer	Hewlett Packard	HP-8901B	3226A04606	150kHz-1300MHz	17 Mar 2022
RF Communication Test Set	Hewlett Packard	HP-8920B	US39064699	30MHz-1GHz	17 Mar 2022
Attenuator (20dB)	Weinschel	46-20-34	BM1347	DC – 18 GHz	See Note 1
FFT Digital Spectrum Analyzer	Advantest	R9211E	8202336	10MHz-100kHz	12 Feb 2021
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	25 Jan 2021
High Pass Filter	Mini Circuits	SHP-300	15542	Cut off 150 MHz	See Note 1
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	18 Mar 2021
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	29 Jul 2021
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	07 Jan 2021
Biconilog	EMCO	3142C	34792	26-2000 MHz	16 May 2022
Horn Antenna	EMCO	3155	5955	1 – 18 GHz	14 Dec 2020
Frequency Counter	EIP	545A	2683	10MHz-1GHz	08 Sep 2022
Environmental Chamber	Thermotron	S-5.5C	29388	-68 to 177°C	10 Jul 2021
Note 1: Internal Verification/Calibration check					

**EXHIBIT 7. MEASUREMENT UNCERTAINTY**

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

Test Description	Combined Standard Uncertainty (U(mx))	Expanded Uncertainty, K=2 for 95% Confidence Level (dB)
Conducted Power	$\pm 0.31$	$\pm 0.62$
Occupied Band and Emission Mask	$\pm 0.62$	$\pm 0.63$
Conducted Out of Band/Spurious Emissions	$\pm 0.36$	$\pm 0.72$
Radiated Spurious Emissions	30 MHz – 1 GHz	
	$\pm 2.10$	$\pm 4.20$
	1 – 18 GHz	
	$\pm 1.35$	$\pm 2.70$
Frequency Stability	Below 1 GHz	
	$\pm 0.60$	$\pm 1.20$
	Above 1 GHz	
	$\pm 0.50$	$\pm 1.00$

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