ENGINEERING TEST REPORT

VHF Transceiver
Model: IC-V10MR
FCC ID: AFJ425910

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.: 22ICOM581_FCC95J

This Test report is Issued under the Authority of Tri M. Luu Vice President of Engineering UltraTech Group of Labs Date: May 13, 2022	
Report Prepared by: Santhosh Fernandez Issued Date: May 13, 2022	Tested by: Nimisha Desai Test Dates: May 5-11, 2022

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UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 95
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2 & 95
Purpose of Test:	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
Test Procedures:	• ANSI C63.26-2015 • ANSI C63.4

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2022	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

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

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

Manufacturer	
Name:	Icom Incorporated
Address:	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
Contact Person:	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.

Brand Name:	ICOM Incorporated
Product Name:	VHF Transceiver
Model Name or Number:	IC-V10MR
Serial Number:	00000206
Type of Equipment:	MURS
Power Supply Requirement:	7.5 VDC nominal
Transmitting/Receiving Antenna Type:	Non-Integral
Primary User Functions of EUT:	Two-way radio

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, industrial or business environment
Power Supply Requirement:	7.5 VDC nominal
RF Output Power Rating:	2 W, 1W, 0.5W
Operating Frequency Range:	151.820, 151.880, 151.940 MHz (Narrowband) 154.570,154.600 MHz (Wideband)
RF Output Impedance:	50 Ω
Occupied Bandwidth(99%):	Narrowband (5.61 kHz) for 151.820, 151.880 and 151.940 MHz Wideband (10.49 kHz) for 154.570, and 154.600 MHz
Modulation Employed:	FM
Emission Designator*:	11K0F3E (Narrowband) 16K0F3E (Wideband)
Antenna Connector Type:	Non-integral

*For Typical Commercial Telephony:

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

Where:

B_n = 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)

Bn = 2M + 2DK
Bn = (2 * 3) + (2 * 2.5 * 1)
Bn = 11.0

Emission Designator: 11K0F3E

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

Bn = 2M + 2DK
Bn = (2 * 3) + (2 * 5 * 1)
Bn = 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

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

Transmitter Test Signals	
Frequency Band(s):	151.820, 151.880, 151.940 MHz (Narrowband) 154.570,154.600 MHz (Wideband)
Test Frequency(ies):	151.820, 151.880 and 151.940 MHz 154.570, and 154.600 MHz
Transmitter Wanted Output Test Signals:	
• Transmitter Power (measured maximum output power):	1.82 W
• Normal Test Modulation:	FM Voice
• Modulating signal source:	External

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, See SAR report

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

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 Data

Frequencies MHz	Wide/ Narrow	Power Rating Watts	Actual Power Watts
151.820	N	2.00	1.80
151.880	N	2.00	1.80
151.940	N	2.00	1.82
154.570	W	2.00	1.75
154.600	W	2.00	1.81
151.820	N	1.00	0.99
151.880	N	1.00	0.99
151.940	N	1.00	0.99
154.570	W	1.00	0.95
154.600	W	1.00	0.98
151.820	N	0.50	0.50
151.880	N	0.50	0.50
151.940	N	0.50	0.50
154.570	W	0.50	0.47
154.600	W	0.50	0.49

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

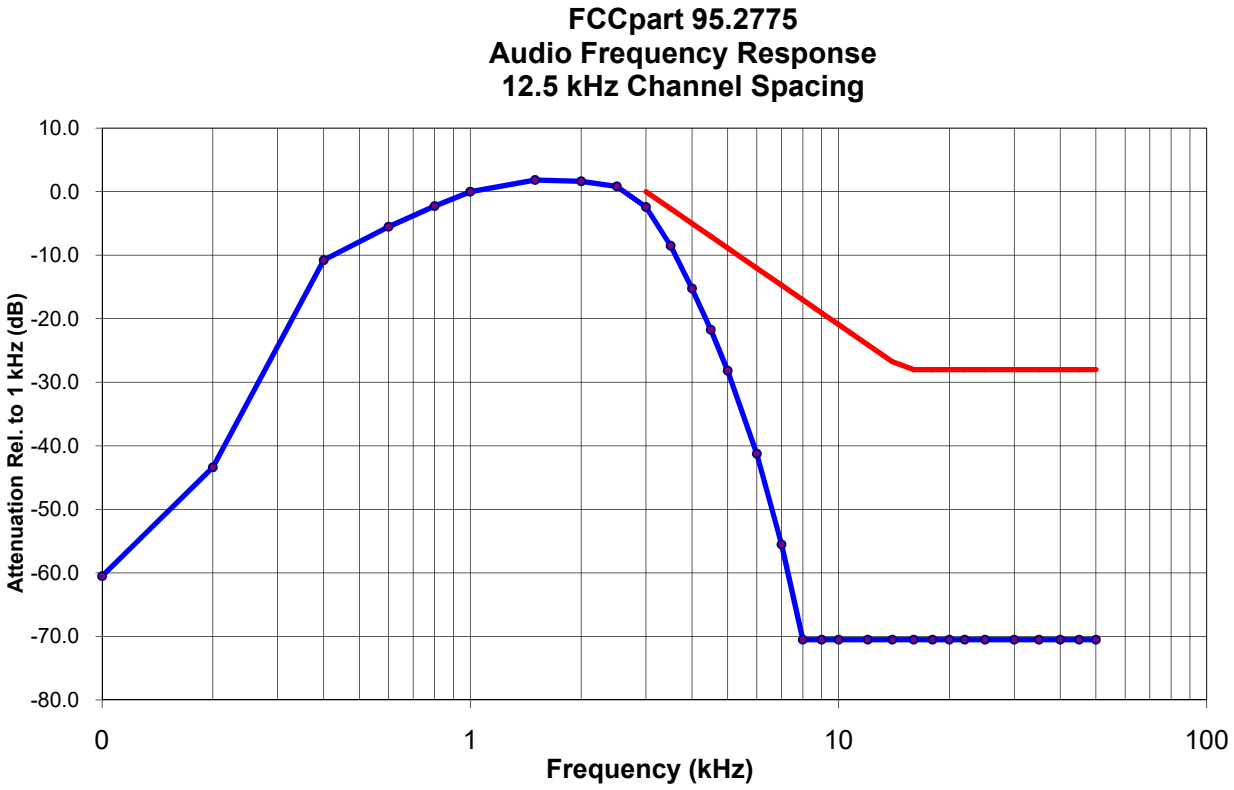
The rated audio input signal was applied to the input of the audio lowpass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT (Audio) spectrum analyzer. Tests were repeated at different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

5.2.3. Test 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.

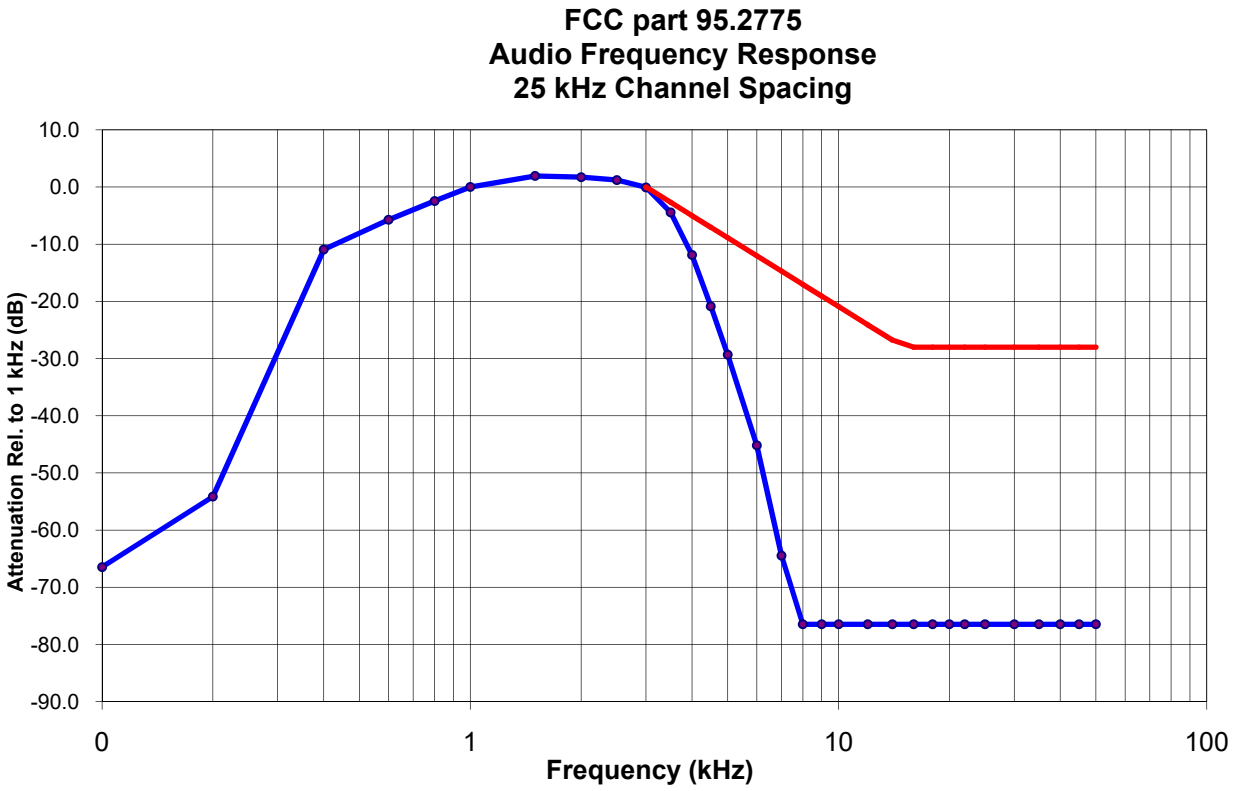
5.2.3.1. Audio Frequency Response of All Modulation States for Narrowband (12.5 kHz)

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	§95.2775(b) Limit (dB)
0.1	-38.27	-60.00	-21.7	-60.5	--
0.2	-38.27	-42.87	-4.6	-43.4	--
0.4	-38.27	-10.26	28.0	-10.8	--
0.6	-38.27	-5.01	33.3	-5.5	--
0.8	-38.27	-1.76	36.5	-2.3	--
1.0	-38.27	0.51	38.8	0.0	--
1.5	-38.27	2.35	40.6	1.8	--
2.0	-38.27	2.14	40.4	1.6	--
2.5	-38.27	1.34	39.6	0.8	--
3.0	-38.27	-1.91	36.4	-2.4	0
3.5	-38.27	-8.00	30.3	-8.5	-3
4.0	-38.27	-14.73	23.5	-15.2	-5
4.5	-38.27	-21.21	17.1	-21.7	-7
5.0	-38.27	-27.67	10.6	-28.2	-9
6.0	-38.27	-40.74	-2.5	-41.2	-12
7.0	-38.27	-55.00	-16.7	-55.5	-15
8.0	-38.27	-70.00	-31.7	-70.5	-17
9.0	-38.27	-70.00	-31.7	-70.5	-19
10.0	-38.27	-70.00	-31.7	-70.5	-21
12.0	-38.27	-70.00	-31.7	-70.5	-24
14.0	-38.27	-70.00	-31.7	-70.5	-27
16.0	-38.27	-70.00	-31.7	-70.5	-28
18.0	-38.27	-70.00	-31.7	-70.5	-28
20.0	-38.27	-70.00	-31.7	-70.5	-28
22.0	-38.27	-70.00	-31.7	-70.5	-28
25.0	-38.27	-70.00	-31.7	-70.5	-28
30.0	-38.27	-70.00	-31.7	-70.5	-28
35.0	-38.27	-70.00	-31.7	-70.5	-28
40.0	-38.27	-70.00	-31.7	-70.5	-28
45.0	-38.27	-70.00	-31.7	-70.5	-28


FCCpart 95.2775
Audio Frequency Response
12.5 kHz Channel Spacing
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Attenuation Rel. to 1 kHz (dB)
0
1
10
100
Frequency (kHz)

5.2.3.2. 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	-38.27	-60.00	-21.7	-66.5	--
0.2	-38.27	-47.67	-9.4	-54.1	--
0.4	-38.27	-4.47	33.8	-10.9	--
0.6	-38.27	0.73	39.0	-5.7	--
0.8	-38.27	4.02	42.3	-2.4	--
1.0	-38.27	6.46	44.7	0.0	--
1.5	-38.27	8.39	46.7	1.9	--
2.0	-38.27	8.18	46.5	1.7	--
2.5	-38.27	7.68	46.0	1.2	--
3.0	-38.27	6.40	44.7	-0.1	0
3.5	-38.27	2.01	40.3	-4.5	-3
4.0	-38.27	-5.42	32.9	-11.9	-5
4.5	-38.27	-14.40	23.9	-20.9	-7
5.0	-38.27	-22.84	15.4	-29.3	-9
6.0	-38.27	-38.71	-0.4	-45.2	-12
7.0	-38.27	-58.00	-19.7	-64.5	-15
8.0	-38.27	-70.00	-31.7	-76.5	-17
9.0	-38.27	-70.00	-31.7	-76.5	-19
10.0	-38.27	-70.00	-31.7	-76.5	-21
12.0	-38.27	-70.00	-31.7	-76.5	-24
14.0	-38.27	-70.00	-31.7	-76.5	-27
16.0	-38.27	-70.00	-31.7	-76.5	-28
18.0	-38.27	-70.00	-31.7	-76.5	-28
20.0	-38.27	-70.00	-31.7	-76.5	-28
22.0	-38.27	-70.00	-31.7	-76.5	-28
25.0	-38.27	-70.00	-31.7	-76.5	-28
30.0	-38.27	-70.00	-31.7	-76.5	-28
35.0	-38.27	-70.00	-31.7	-76.5	-28
40.0	-38.27	-70.00	-31.7	-76.5	-28
45.0	-38.27	-70.00	-31.7	-76.5	-28



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 Data

5.3.3.1. Modulation Limiting for Narrowband (12.5 kHz)

Modulating Signal Level	Peak Modulation Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
2	0.05	0.14	0.28	0.40	0.05	2.5
4	0.05	0.23	0.53	0.76	0.06	2.5
6	0.04	0.34	0.77	1.08	0.07	2.5
8	0.05	0.44	1.04	1.13	0.09	2.5
10	0.04	0.52	1.24	1.15	0.09	2.5
15	0.05	0.77	1.81	1.16	0.10	2.5
20	0.05	1.02	1.93	1.18	0.11	2.5
25	0.05	1.27	1.97	1.18	0.10	2.5
30	0.05	1.50	2.00	1.17	0.10	2.5
35	0.05	1.74	2.02	1.17	0.13	2.5
40	0.05	1.94	2.03	1.18	0.14	2.5
45	0.05	1.97	2.04	1.19	0.14	2.5
50	0.05	1.98	2.05	1.19	0.14	2.5
60	0.06	2.00	2.07	1.19	0.16	2.5
70	0.06	2.00	2.07	1.20	0.16	2.5
80	0.06	1.96	2.07	1.21	0.17	2.5
90	0.06	1.99	2.07	1.21	0.17	2.5
100	0.06	2.27	2.07	1.21	0.17	2.5

Remarks

Standard Modulation Level: 12.2 mV
Voice Signal Input Level: Standard Modulation Level + 16 dB = 37.73 dB(mVrms) =76.98 Vrms

Modulation Frequency (kHz	Peak Depth (kHz)	Maximum Limit (kHz)
0.1	0.05	2.5
0.2	0.05	2.5
0.4	2.09	2.5
0.6	2.06	2.5
0.8	2.07	2.5
1.0	2.06	2.5
1.2	1.99	2.5
1.4	2.00	2.5
1.6	1.98	2.5
1.8	1.95	2.5
2.0	1.92	2.5
2.5	1.73	2.5
3.0	1.21	2.5
3.5	0.64	2.5
4.0	0.34	2.5
4.5	0.23	2.5
5.0	0.16	2.5
6.0	0.07	2.5
7.0	0.07	2.5
8.0	0.15	2.5
9.0	0.04	2.5
10.0	0.04	2.5

5.3.3.2. Modulation Limiting for Wideband (25 kHz)

Modulating Signal Level	Peak Modulation Deviation (kHz)					Maximum Limit
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(kHz)
2	0.06	0.27	0.55	1.06	0.08	5.0
4	0.06	0.43	1.02	2.03	0.10	5.0
6	0.07	0.62	1.51	2.82	0.13	5.0
8	0.07	0.83	2.02	2.93	0.14	5.0
10	0.07	1.00	2.44	2.97	0.15	5.0
15	0.07	1.48	3.54	3.00	0.16	5.0
20	0.07	1.98	3.72	3.02	0.18	5.0
25	0.07	2.45	3.83	3.04	0.15	5.0
30	0.07	2.89	3.93	3.02	0.17	5.0
35	0.07	3.38	3.97	3.02	0.21	5.0
40	0.07	3.74	3.98	3.04	0.23	5.0
45	0.07	3.81	3.99	3.05	0.24	5.0
50	0.07	3.84	4.03	3.05	0.25	5.0
60	0.07	3.89	4.04	3.06	0.28	5.0
70	0.07	3.92	4.03	3.06	0.31	5.0
80	0.07	3.86	4.03	3.08	0.31	5.0
90	0.07	3.87	4.03	3.08	0.31	5.0
100	0.07	4.32	4.03	3.08	0.31	5.0

Remarks

Standard Modulation Level: 12.2 mV
Voice Signal Input Level: Standard Modulation Level + 16 dB = 37.73 dB(mVrms) =76.98 Vrms

Modulation Frequency (kHz	Peak Depth (kHz)	Maximum Limit (kHz)
0.1	0.08	5.0
0.2	0.07	5.0
0.4	4.05	5.0
0.6	4.01	5.0
0.8	4.03	5.0
1.0	4.03	5.0
1.2	3.96	5.0
1.4	3.89	5.0
1.6	3.87	5.0
1.8	3.82	5.0
2.0	3.77	5.0
2.5	3.52	5.0
3.0	3.08	5.0
3.5	1.92	5.0
4.0	0.90	5.0
4.5	0.46	5.0
5.0	0.31	5.0
6.0	0.14	5.0
7.0	0.10	5.0
8.0	0.28	5.0
9.0	0.05	5.0
10.0	0.06	5.0

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 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 ÷ 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 ÷ 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 Data

5.4.3.1. 99% Occupied Bandwidth

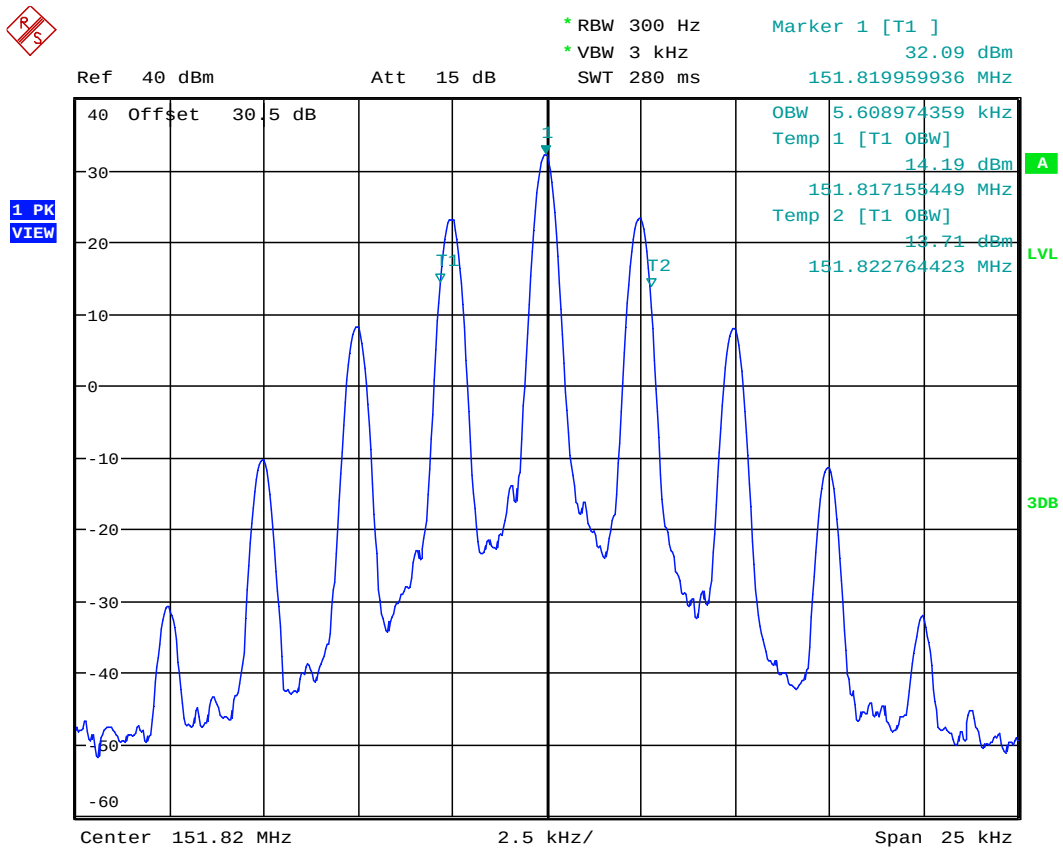
Remark: 99% Occupied Bandwidth measurements were done using the built-in auto function of the analyzer.

Frequency (MHz)	Channel Spacing (kHz)	Measured 99% OBW (kHz)	Authorized Bandwidth (kHz)
151.820	12.5	5.61	11.25
151.880	12.5	5.61	11.25
151.940	12.5	5.61	11.25
154.570	25.0	10.49	20.0
154.600	25.0	10.49	20.0

See the following plots for details of measurements.

5.4.3.2. Configuration: 99% OBW, CH 5 151.820 MHz, 12.5 KHz, High power

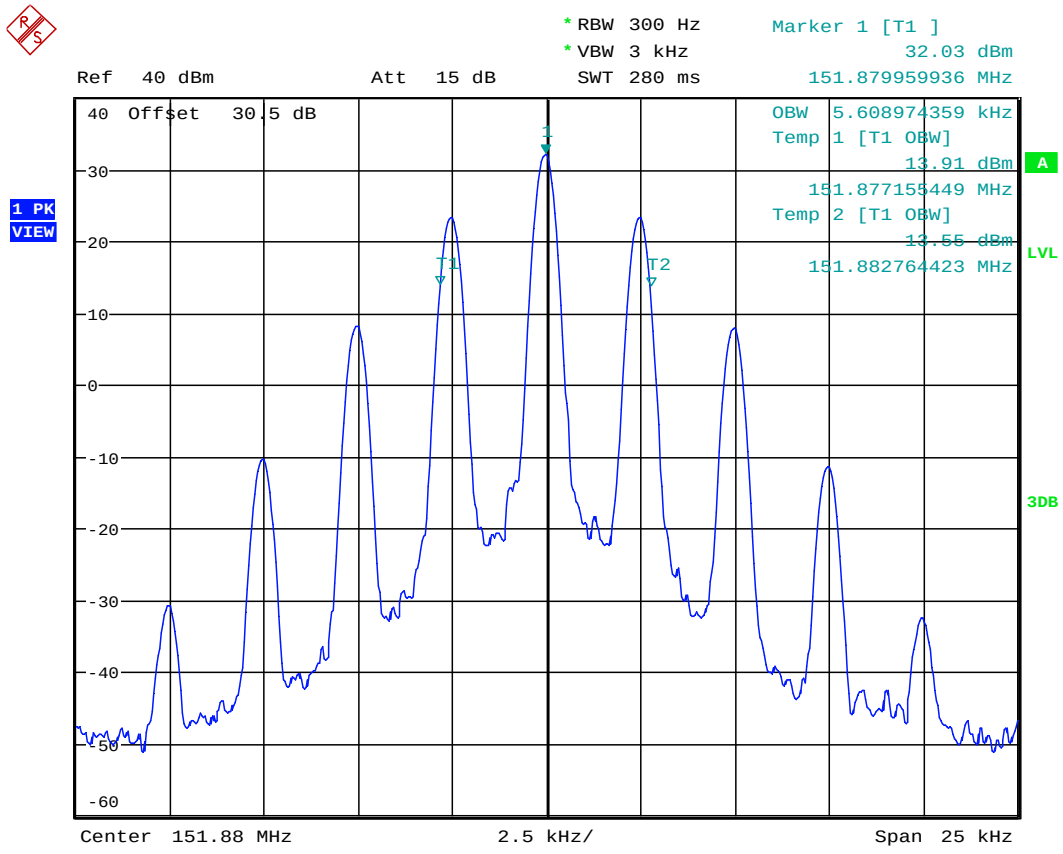
OBW: 5.61 KHz



Date: 5.MAY.2022 15:57:44

5.4.3.3. Configuration: 99% OBW, CH 1 151.880 MHz, 12.5 KHz, High power

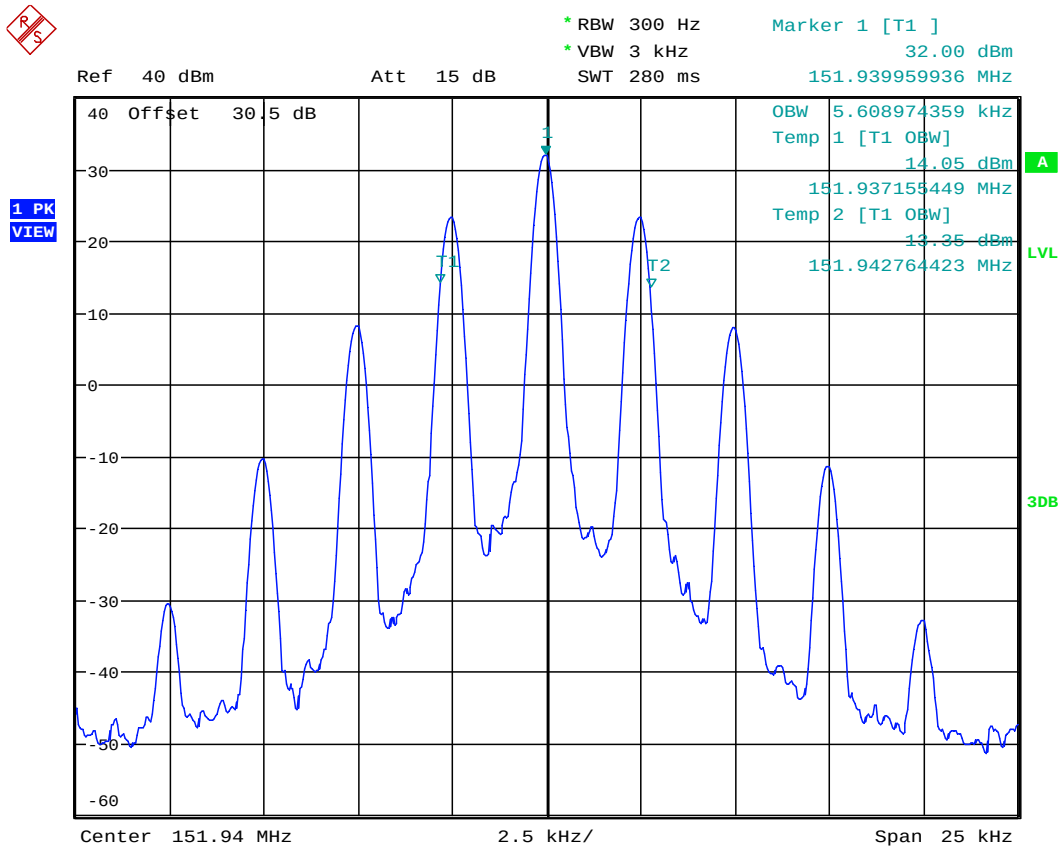
OBW: 5.61 KHz



Date: 5.MAY.2022 16:02:42

5.4.3.4. Configuration: 99% OBW, CH 7 151.940 MHz, 12.5 KHz, High power

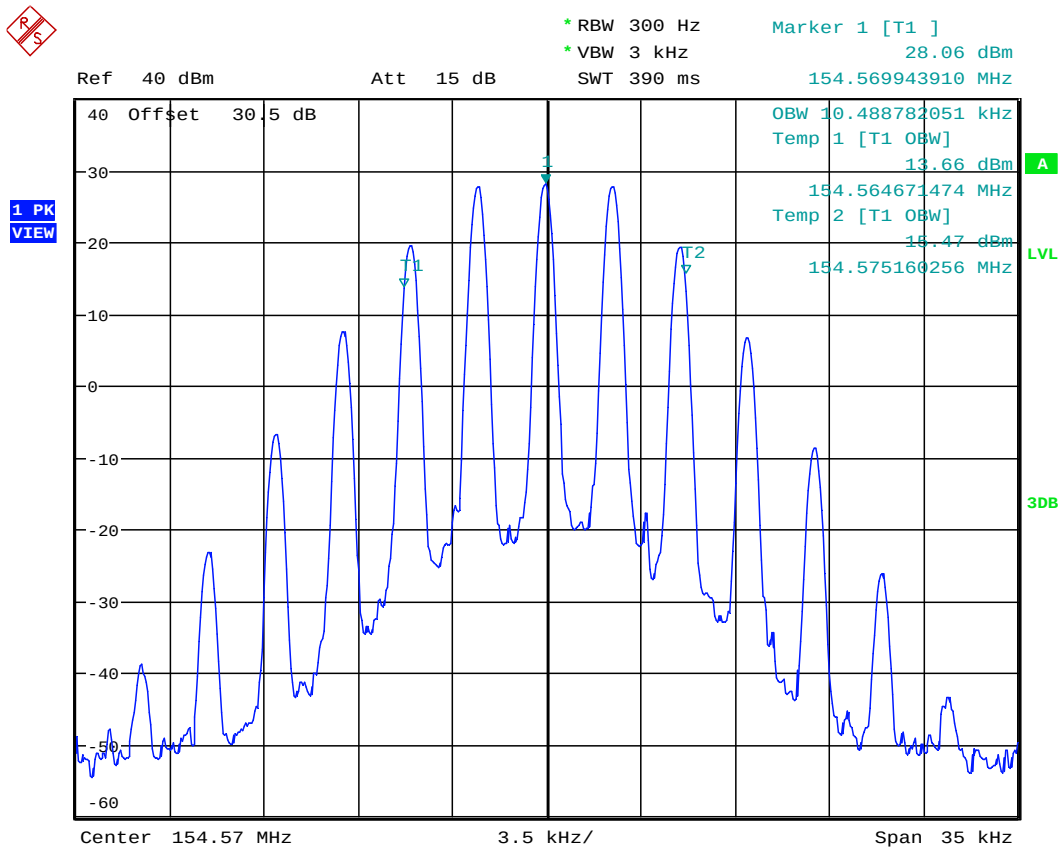
OBW: 5.61 KHz



Date: 5.MAY.2022 16:03:56

5.4.3.5. Configuration: 99% OBW, CH 3 154.570 MHz, 25 KHz, High power

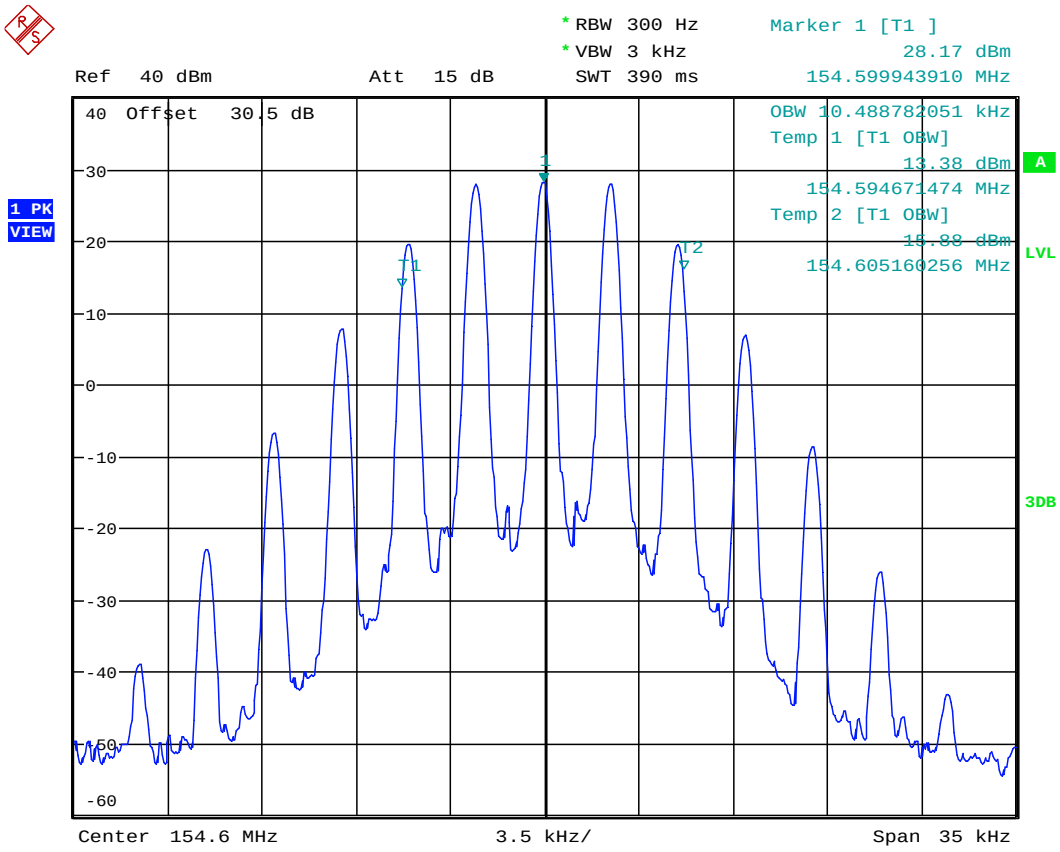
OBW: 10.49 KHz



Date: 5.MAY.2022 16:06:53

5.4.3.6. Configuration: 99% OBW, CH 9 154.600 MHz, 25 KHz, High power

OBW: 10.49 KHz

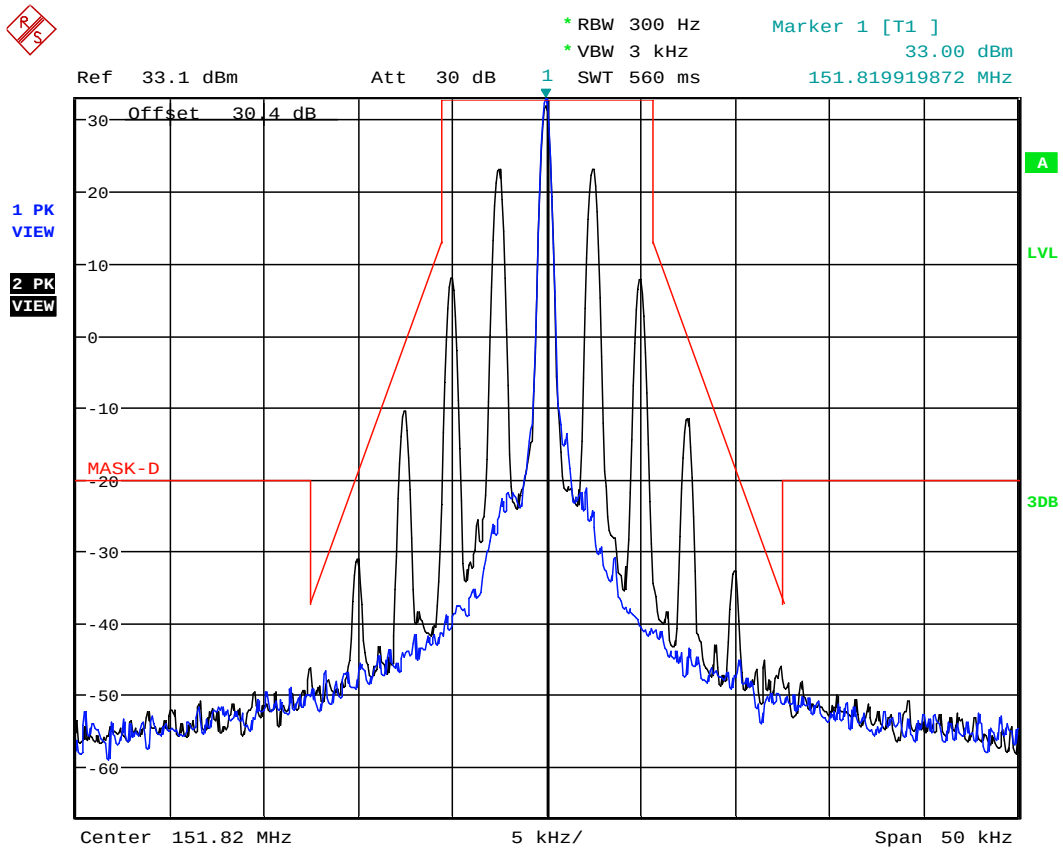


Date: 5.MAY.2022 16:08:11

MASK D

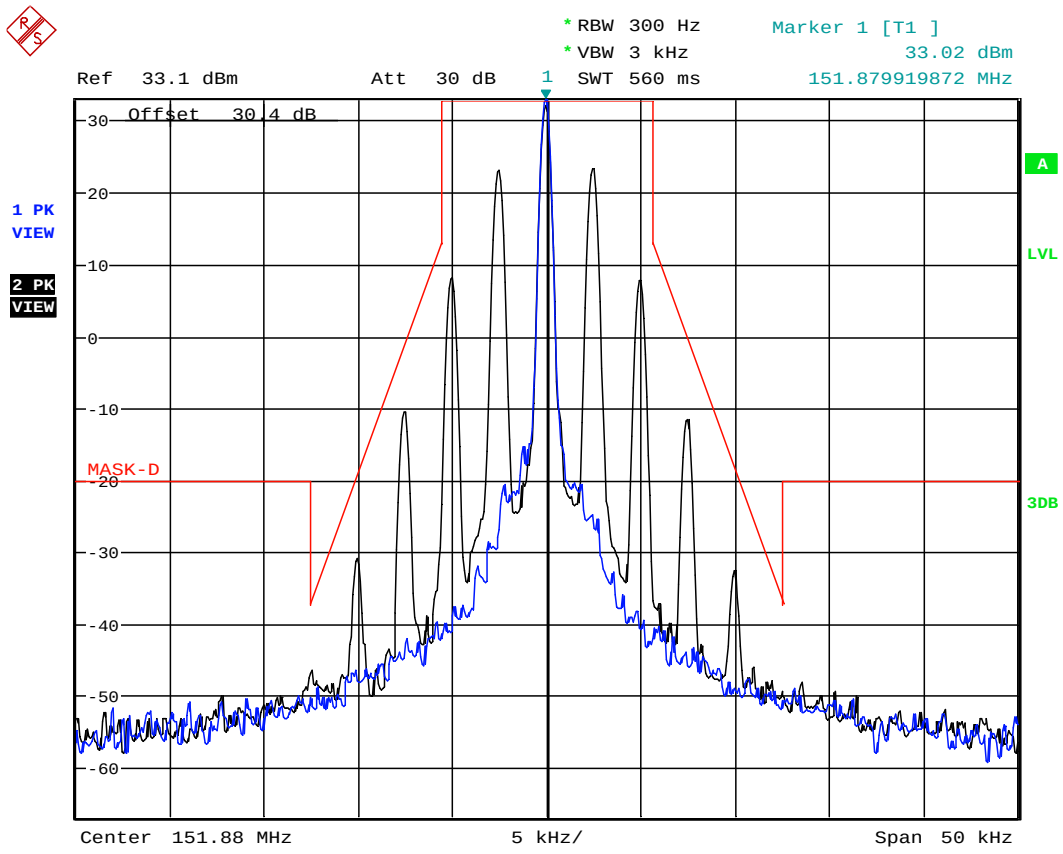
High Power

5.4.3.7. Configuration: Mask D, CH 5 151.820 MHz, 12.5 KHz, High power



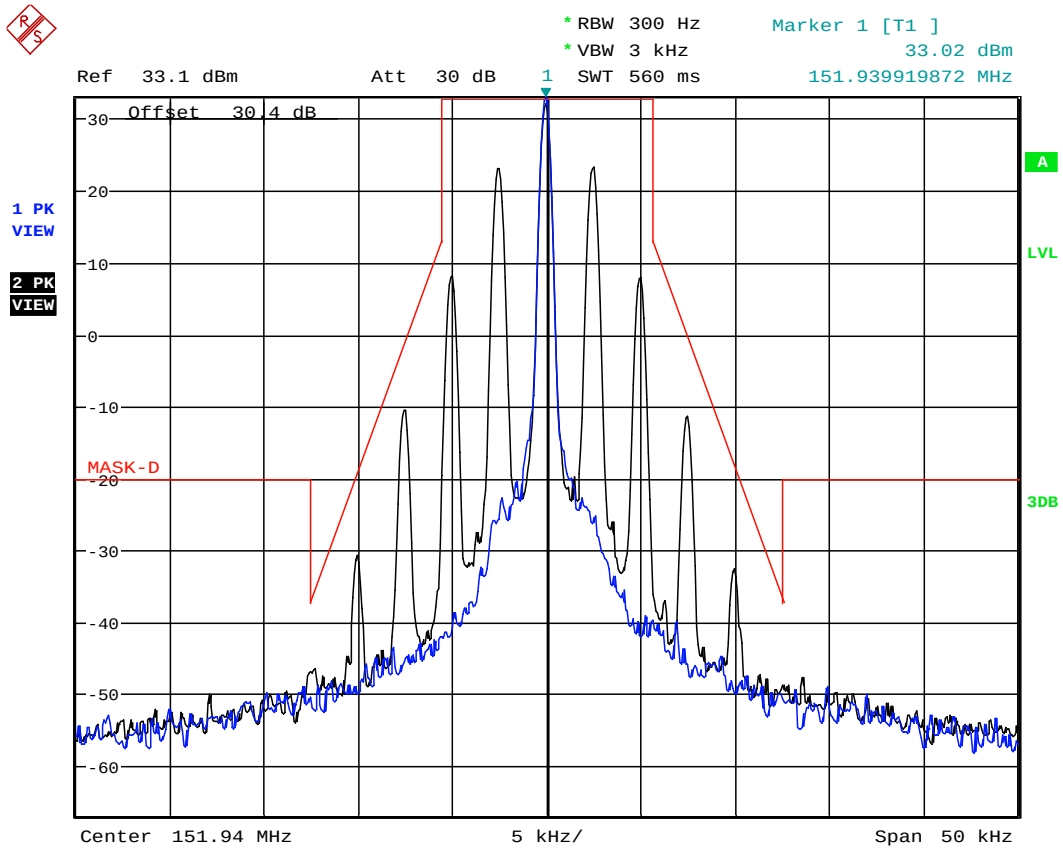
Date: 6.MAY.2022 14:10:24

5.4.3.8. Configuration: Mask D, CH 1 151.880 MHz, 12.5 KHz, High power



Date: 6.MAY.2022 14:12:41

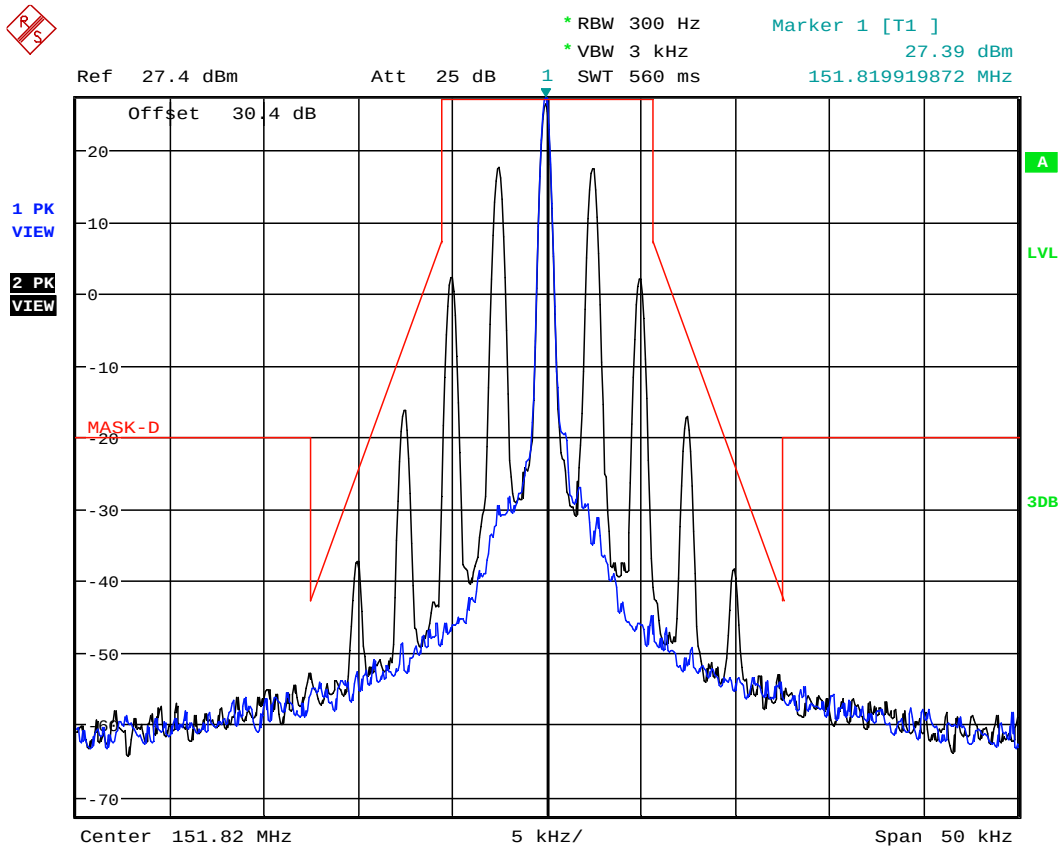
5.4.3.9. Configuration: Mask D, CH 7 151.940 MHz, 12.5 KHz, High power



Date: 6.MAY.2022 14:14:17

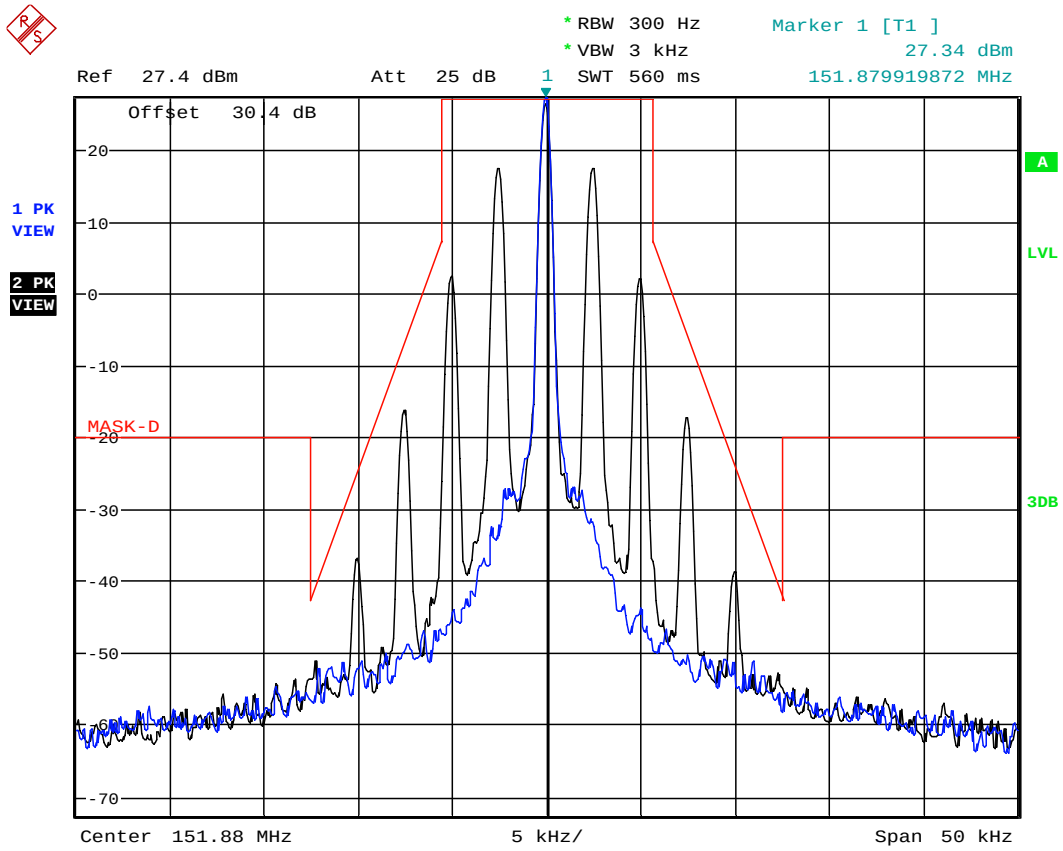
Low Power

5.4.3.10. Configuration: Mask D, CH 6 151.820 MHz, 12.5 KHz, Low power



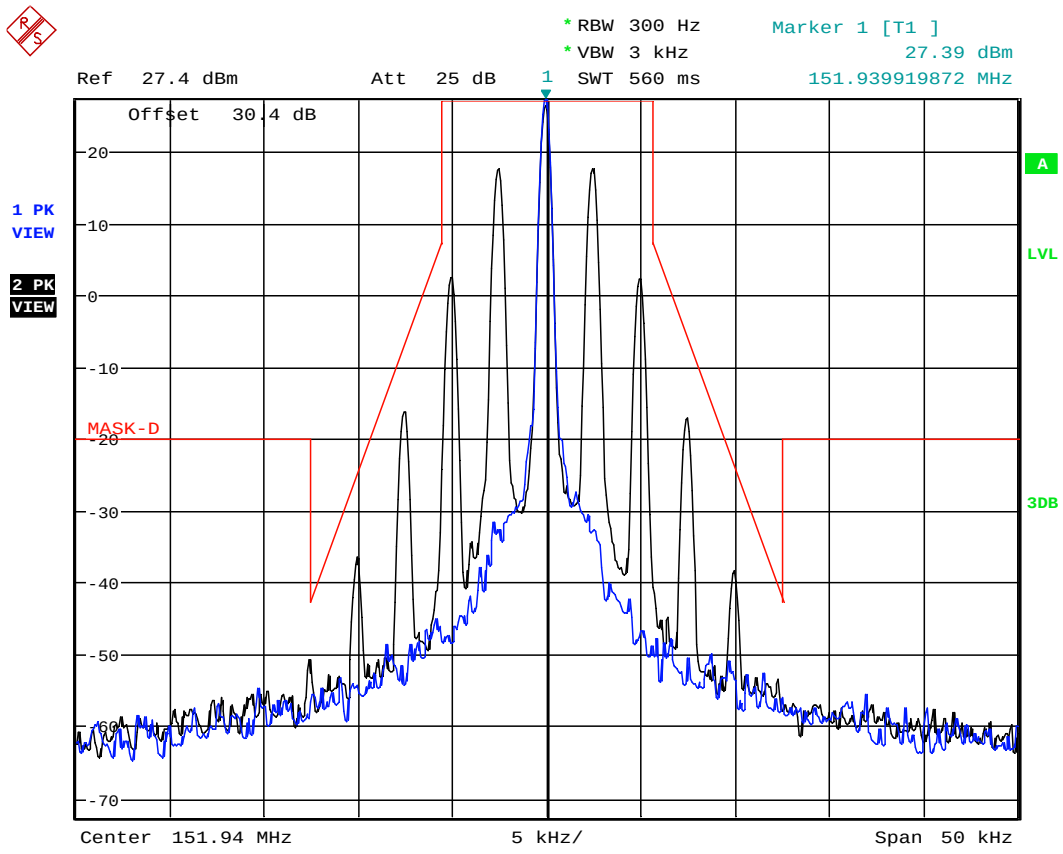
Date: 6.MAY.2022 14:16:49

5.4.3.11. Configuration: Mask D, CH 2 151.880 MHz, 12.5 KHz, Low power



Date: 6.MAY.2022 14:18:46

5.4.3.12. Configuration: Mask D, CH 8 151.940 MHz, 12.5 KHz, Low power

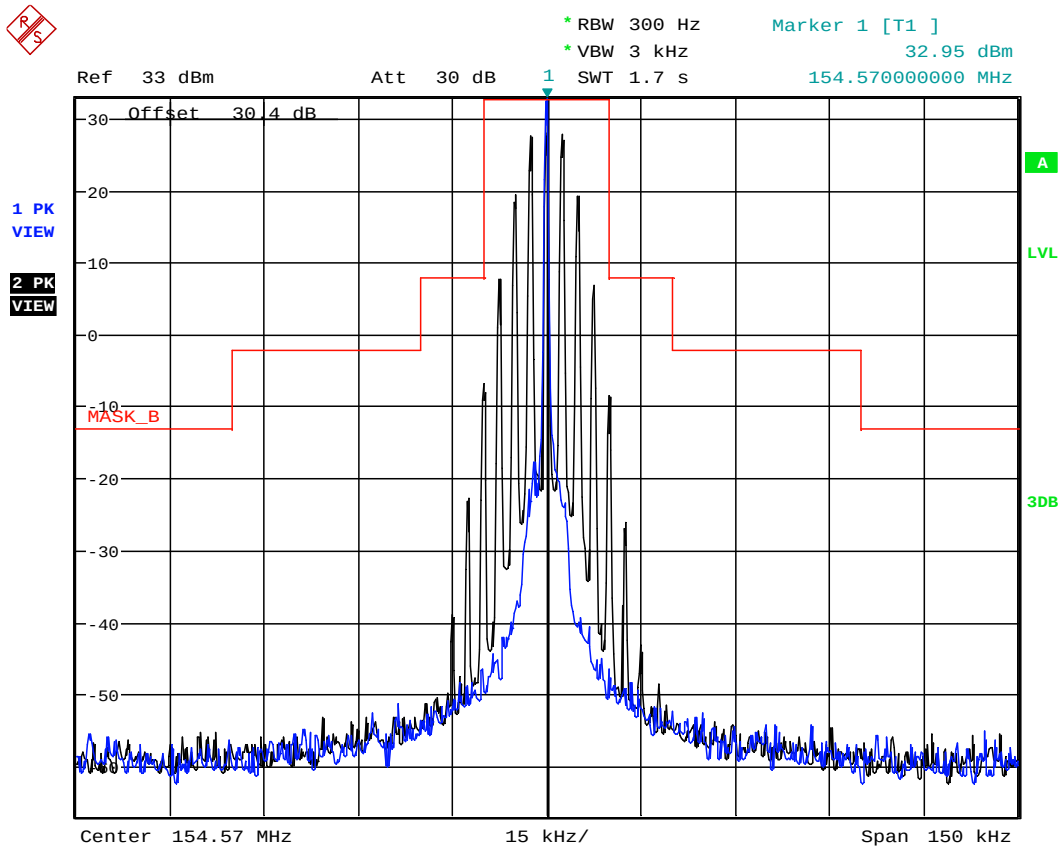


Date: 6.MAY.2022 14:20:55

MASK B

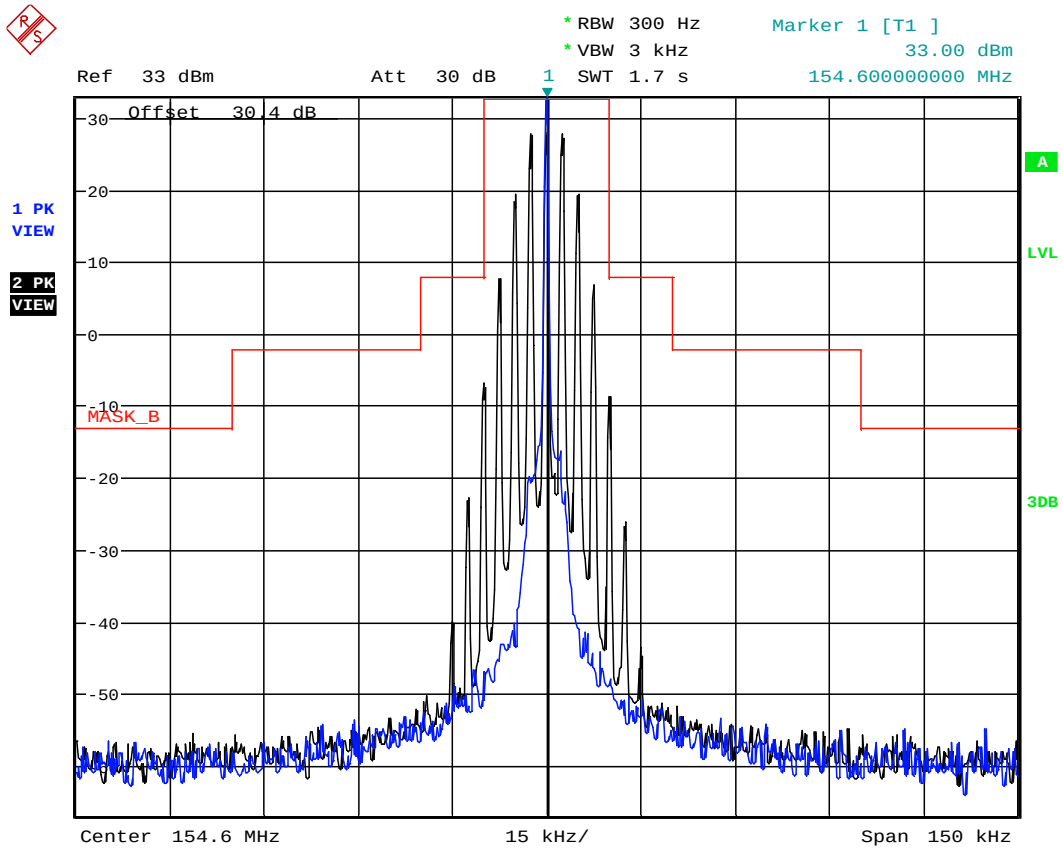
High Power

5.4.3.13. Configuration: Mask B, CH 3 154.570 MHz, 25 KHz, High power



Date: 6.MAY.2022 13:54:18

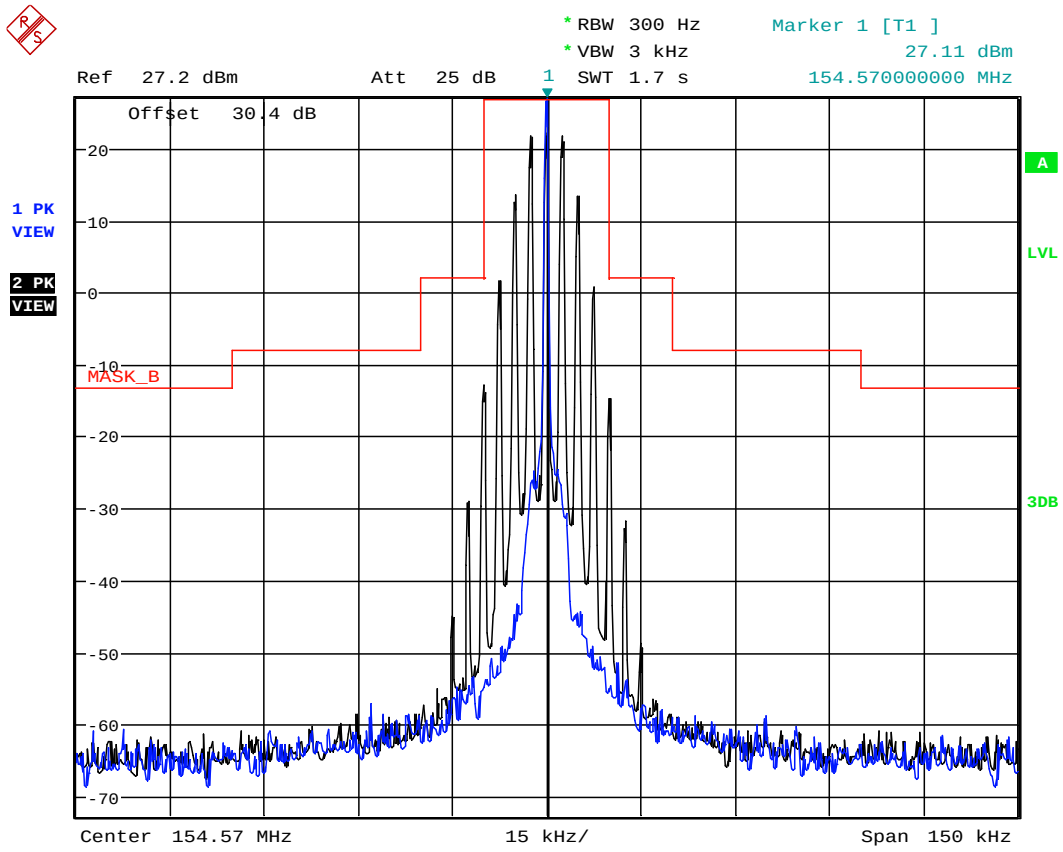
5.4.3.14. Configuration: Mask B, CH 9 154.600 MHz, 25 KHz, High power



Date: 6.MAY.2022 13:51:37

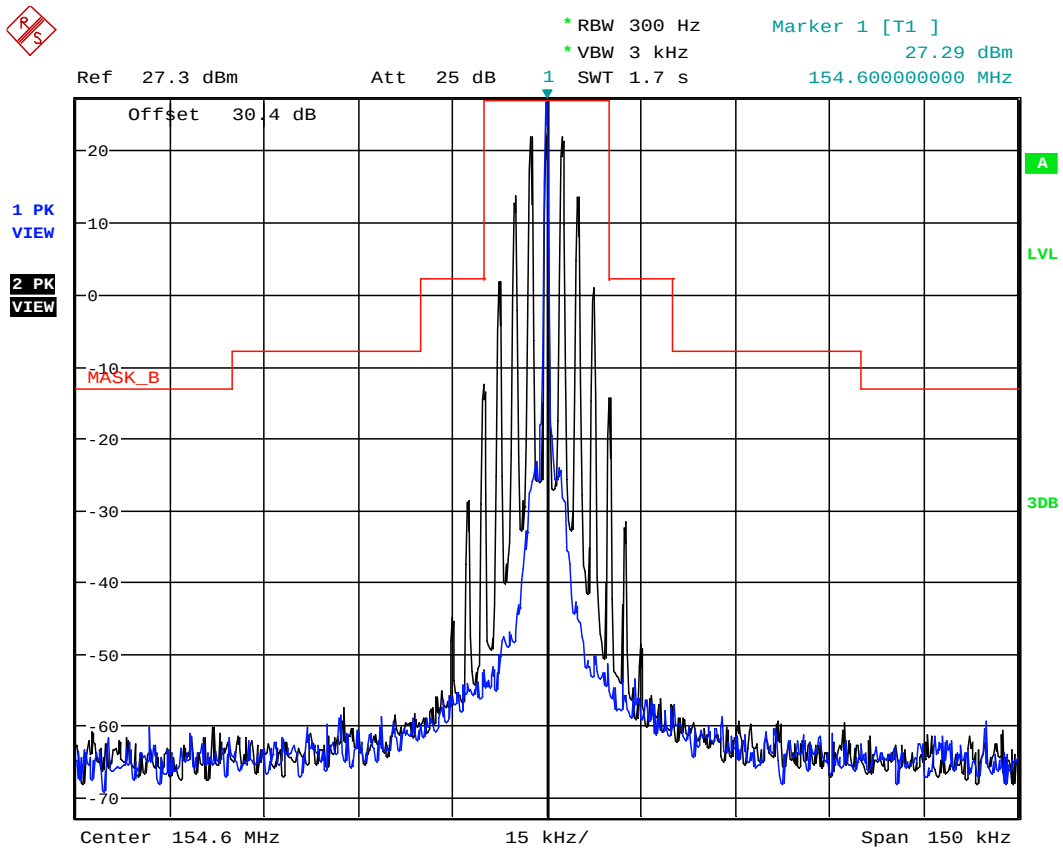
Low Power

5.4.3.15. Configuration: Mask B, CH 4 154.570 MHz, 25 KHz, Low power



Date: 6.MAY.2022 13:56:57

5.4.3.16. Configuration: Mask B, CH 10 154.600 MHz, 25 KHz, Low power



Date: 6.MAY.2022 13:59:33

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.

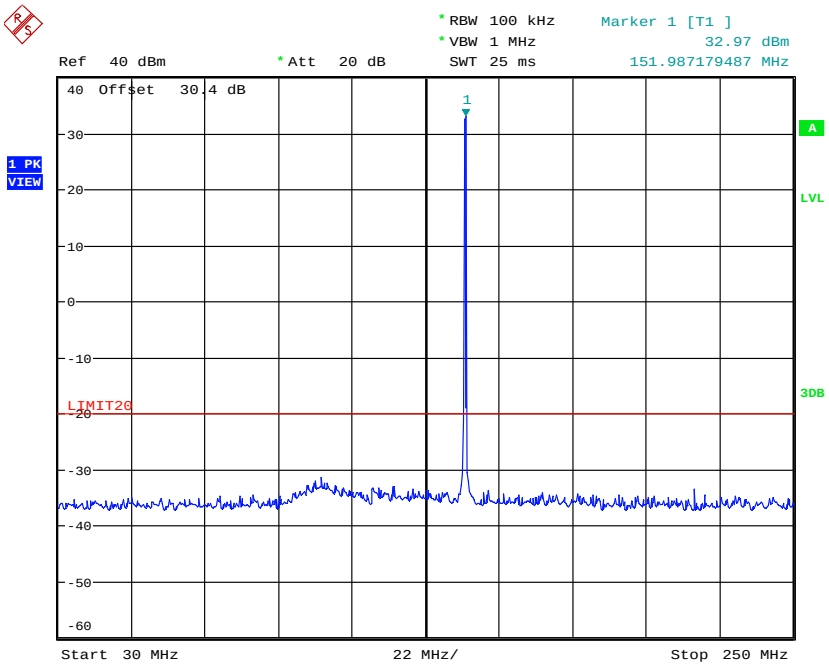
5.5.2. Method of Measurements

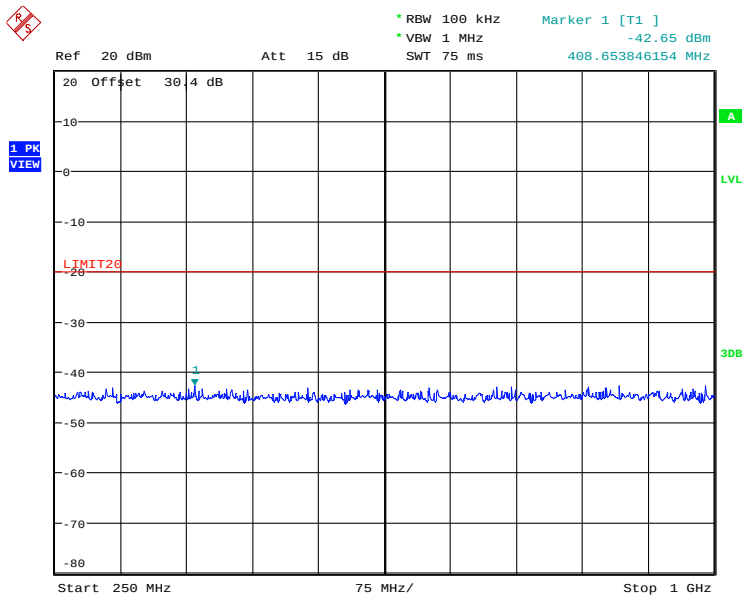
ANSI C63.26 Section 5.7.

5.5.3. Test Data

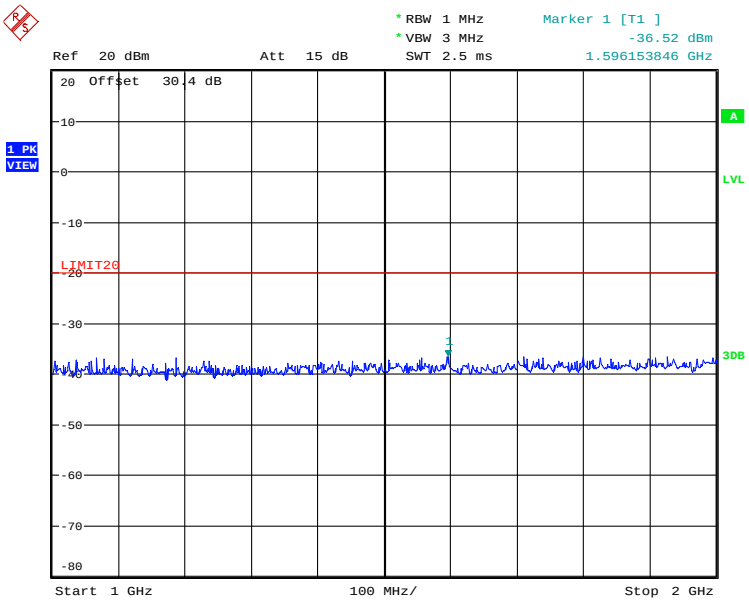
High Power

5.5.3.1. Configuration: Tx Conducted, CH 5 151.820 MHz, 12.5 KHz, High power



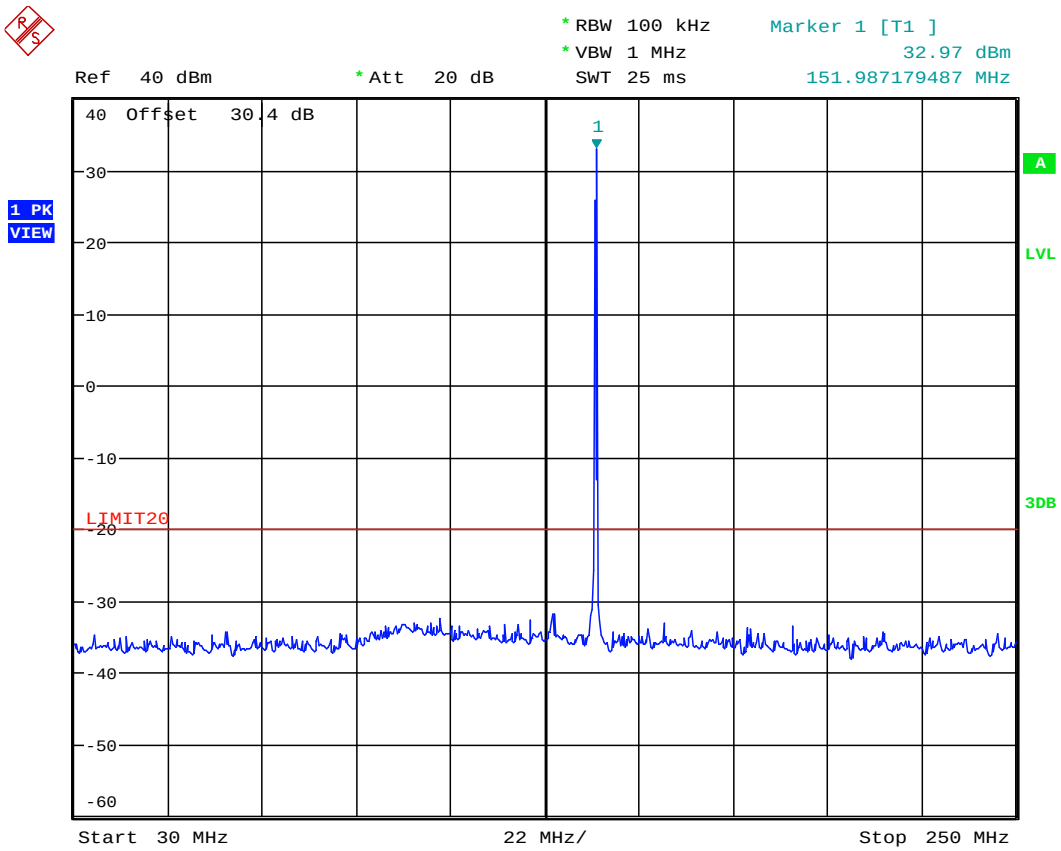


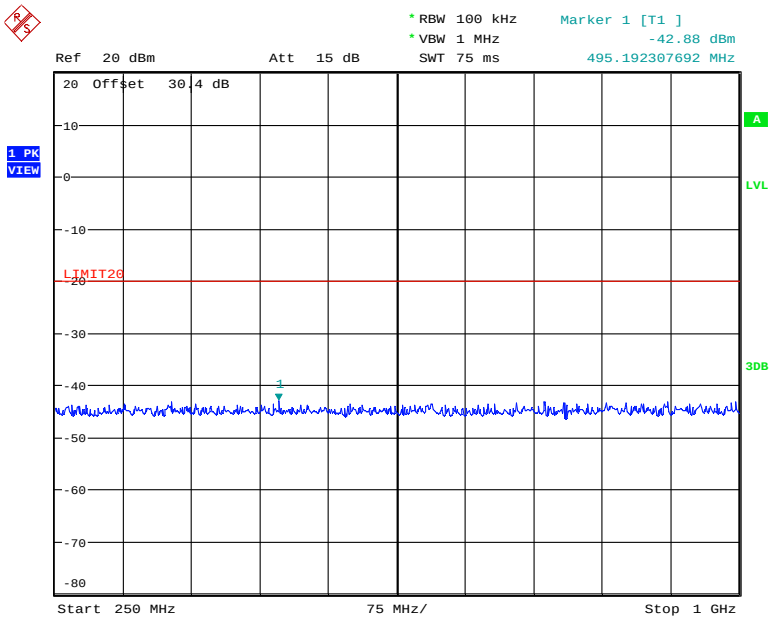
Date: 6.MAY.2022 14:46:22



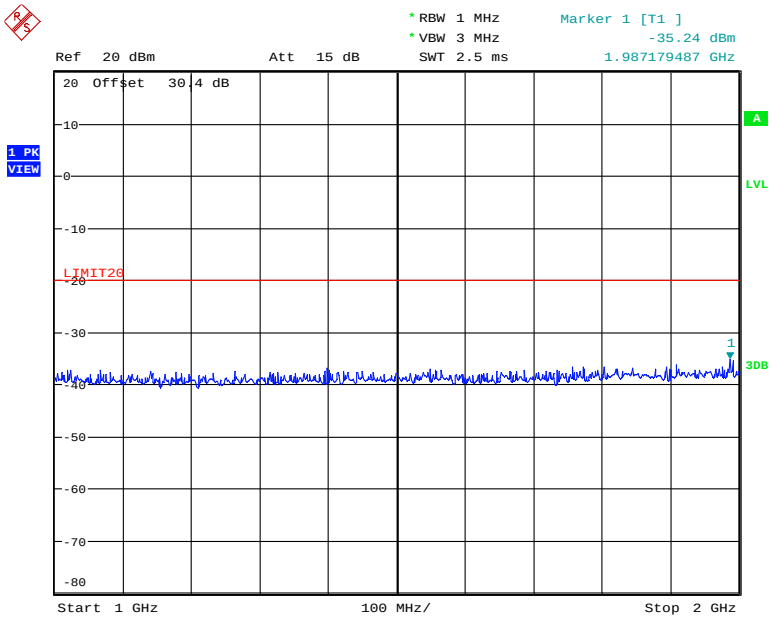
Date: 6.MAY.2022 14:56:33

5.5.3.2. Configuration: Tx Conducted, CH 1 151.880 MHz, 12.5 KHz, High power



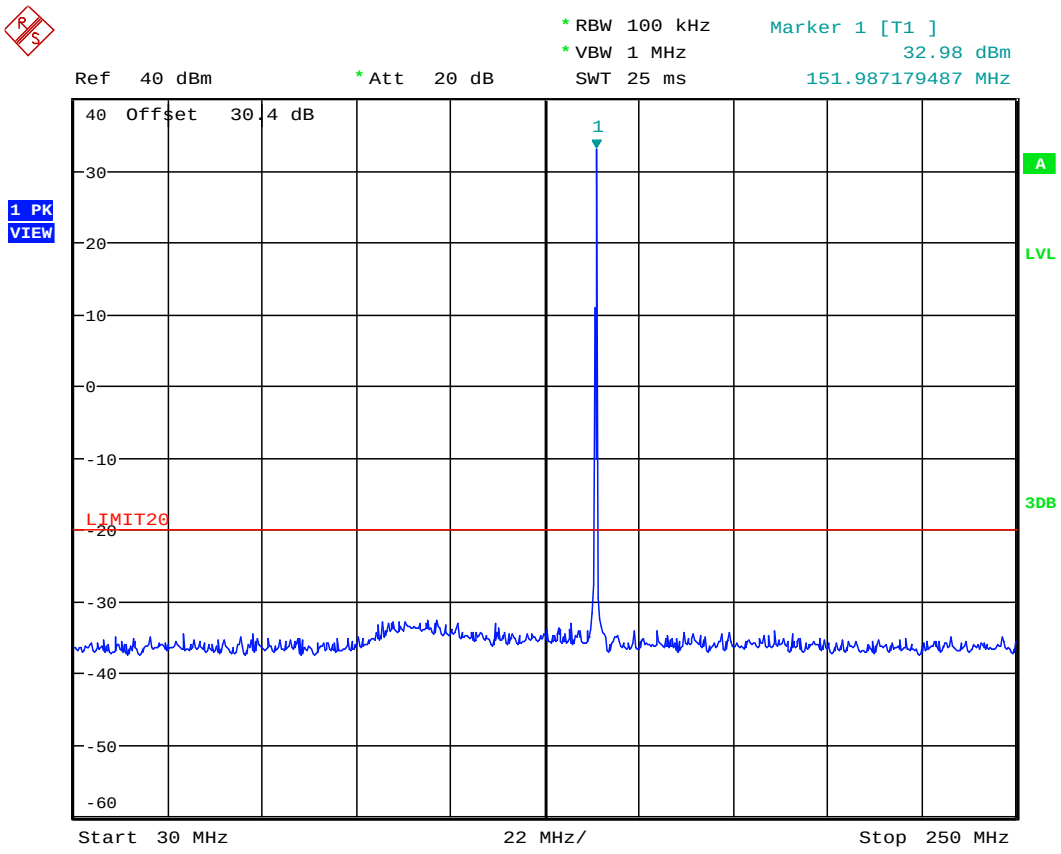


Date: 6.MAY.2022 14:48:24

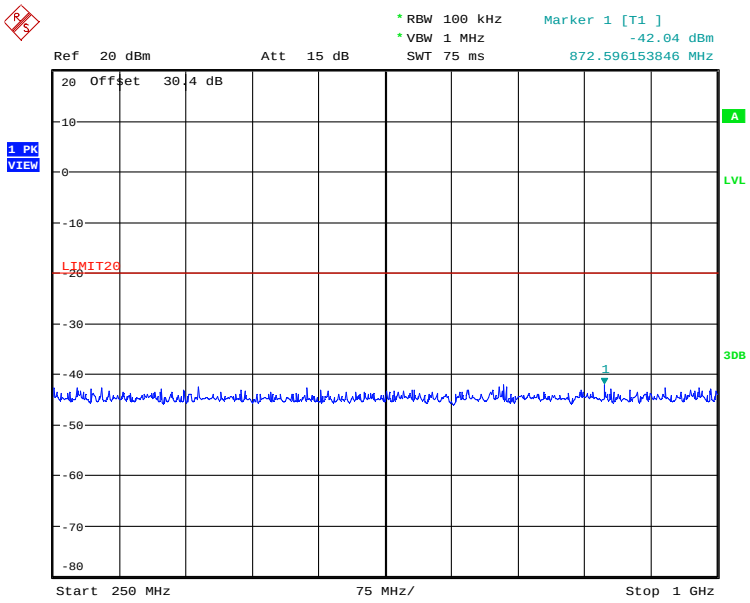


Date: 6.MAY.2022 14:58:29

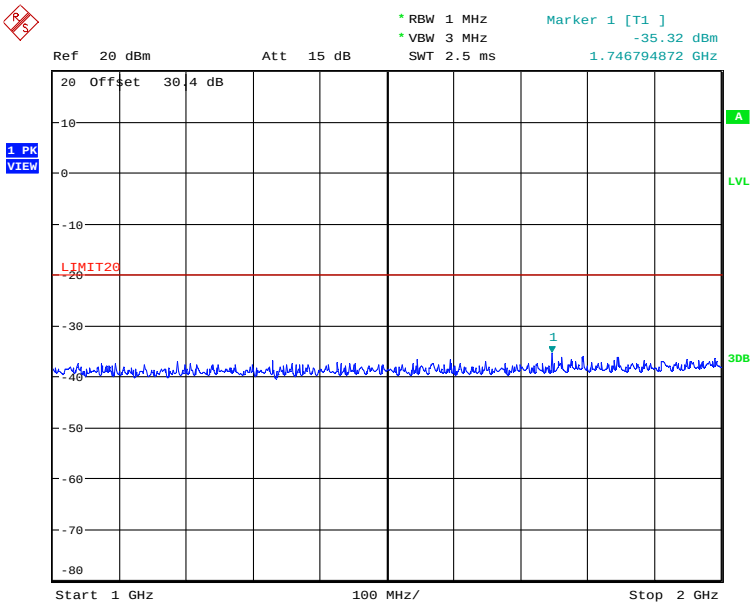
5.5.3.3. Configuration: Tx Conducted, CH 7 151.940 MHz, 12.5 KHz, High power



Date: 6.MAY.2022 14:39:14



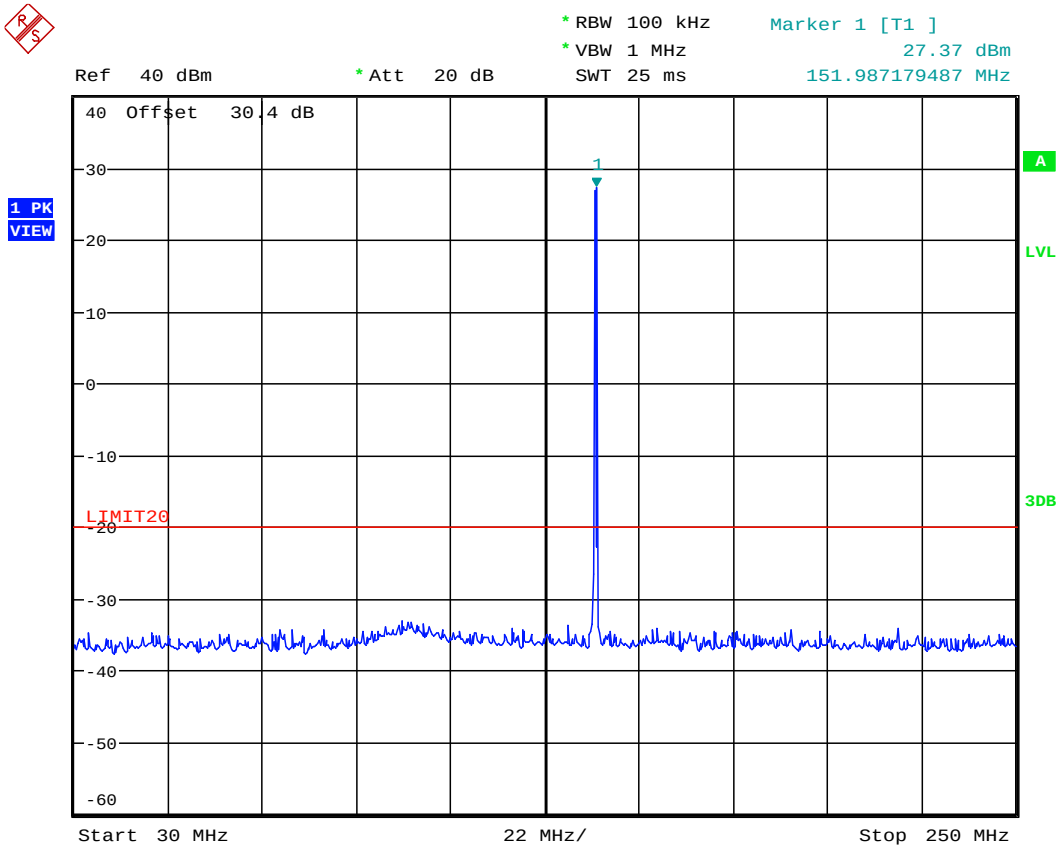
Date: 6.MAY.2022 14:50:21



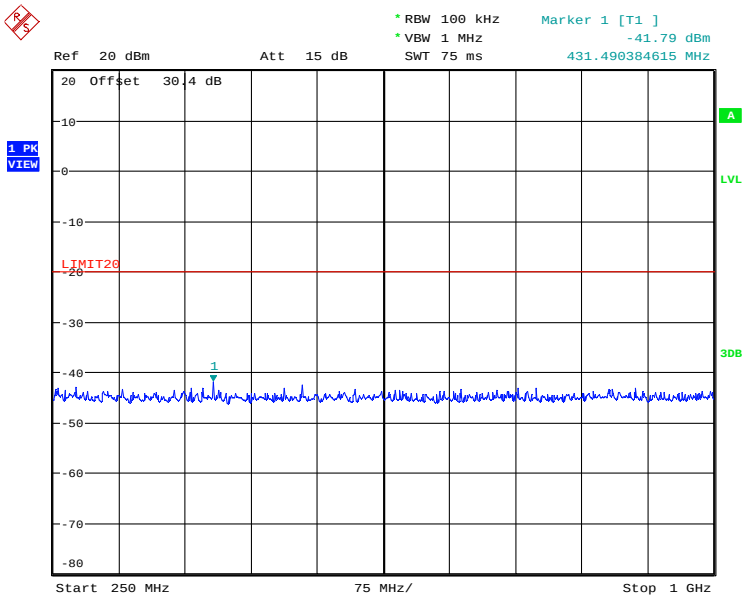
Date: 6.MAY.2022 15:00:27

Low Power

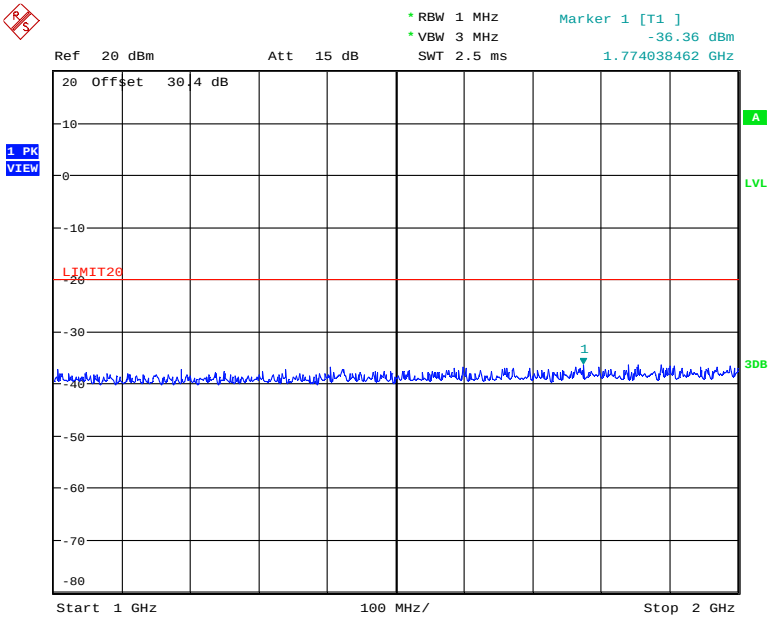
5.5.3.4. Configuration: Tx Conducted, CH 6 151.820 MHz, 12.5 KHz, Low power



Date: 6.MAY.2022 14:36:26

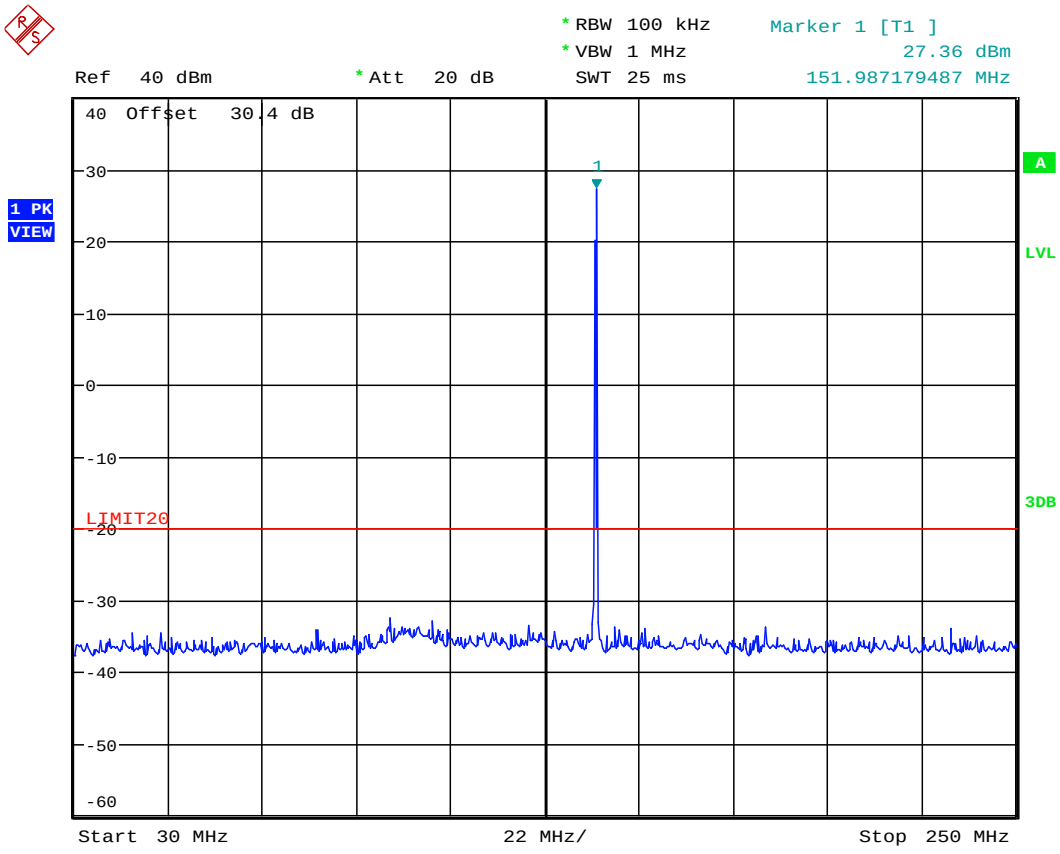


Date: 6.MAY.2022 14:47:16

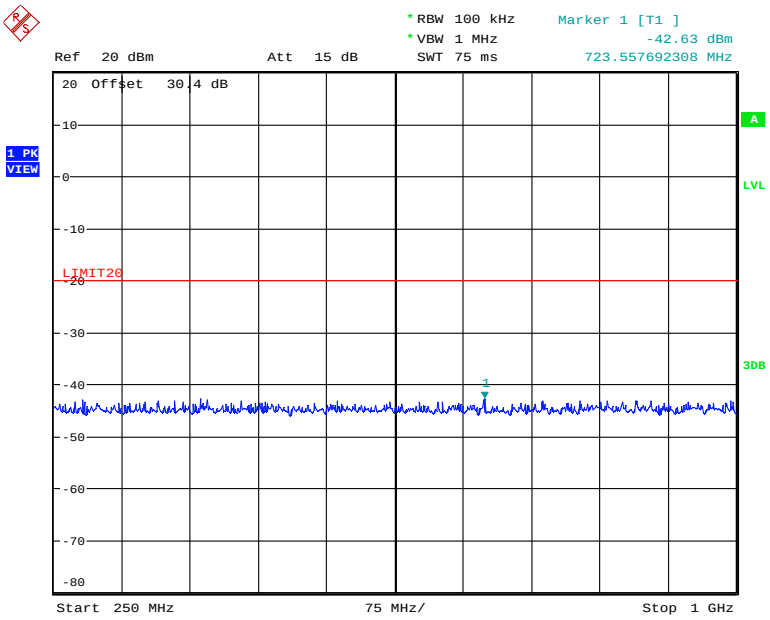


Date: 6.MAY.2022 14:57:26

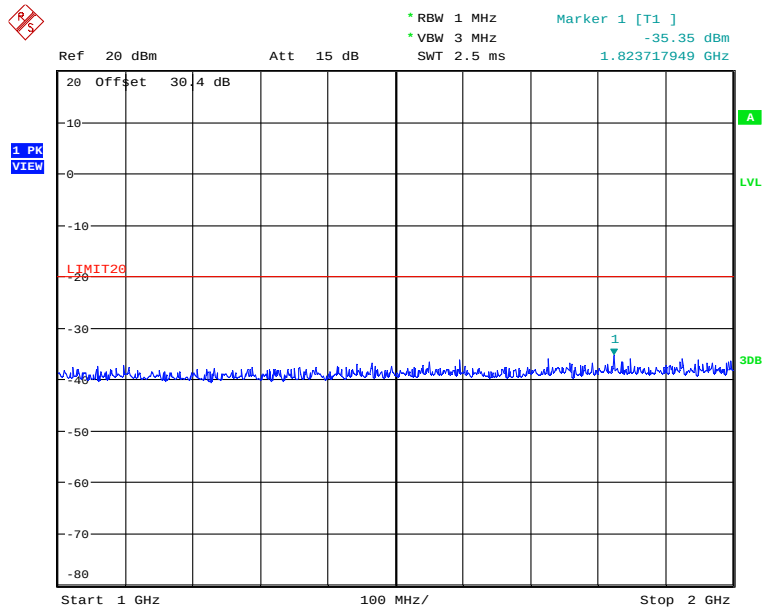
5.5.3.5. Configuration: Tx Conducted, CH 2 151.880 MHz, 12.5 KHz, Low power



Date: 6.MAY.2022 14:38:15

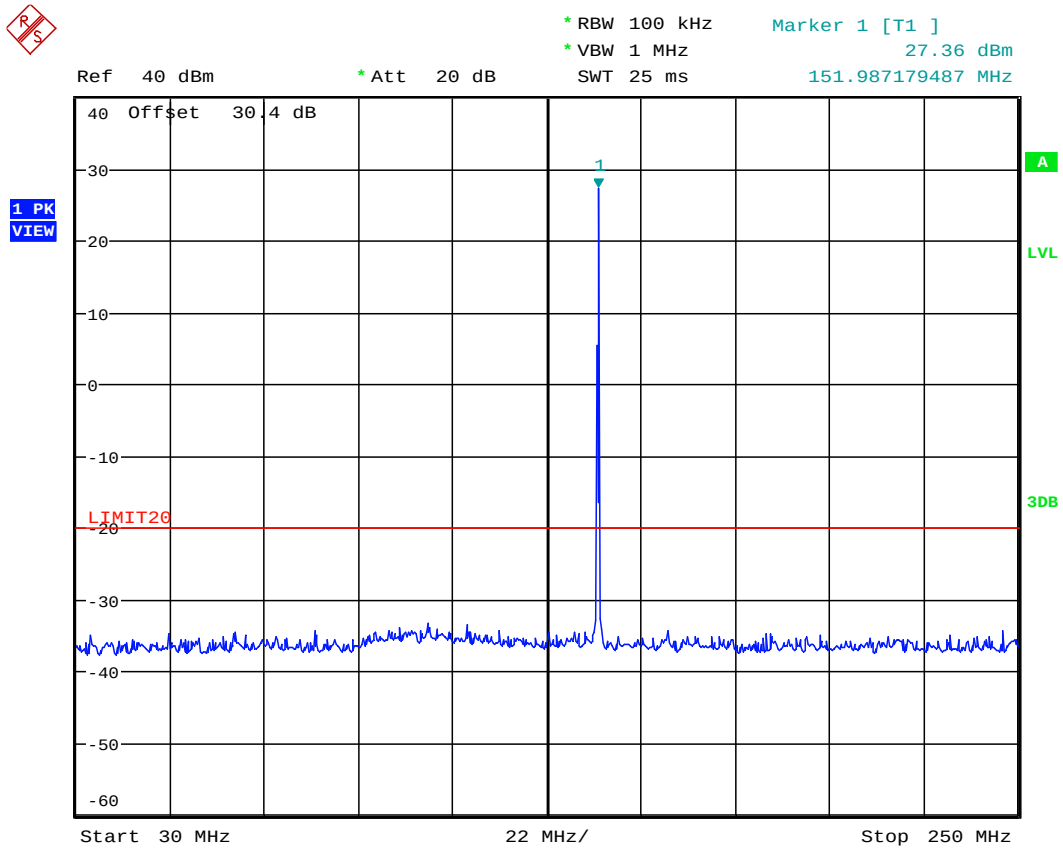


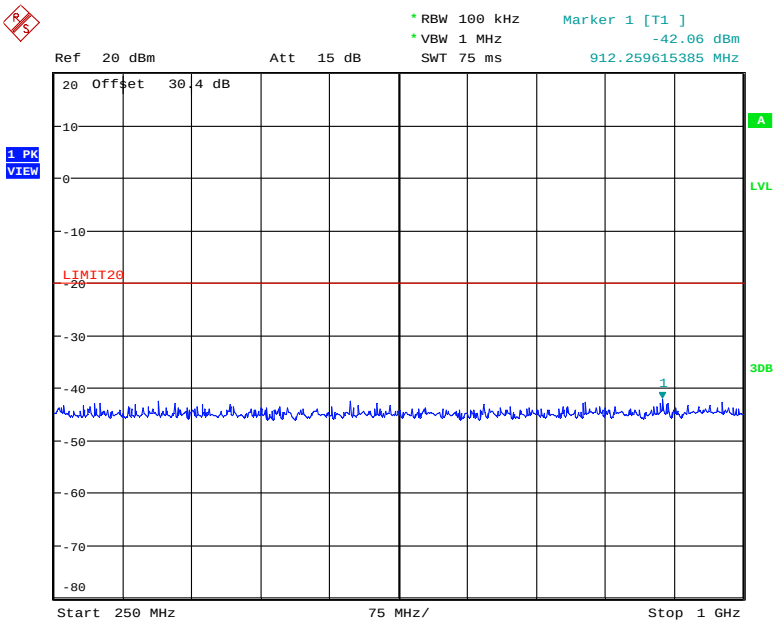
Date: 6.MAY.2022 14:49:15



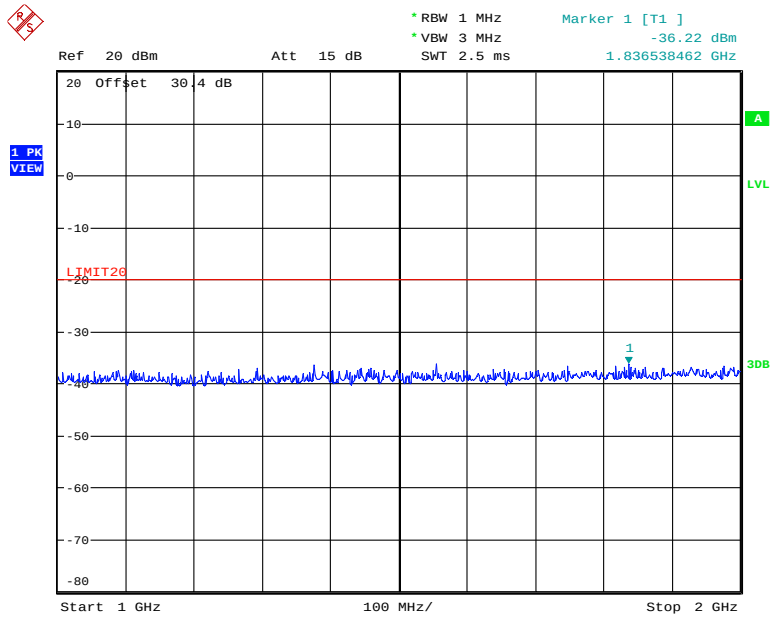
Date: 6.MAY.2022 14:59:33

5.5.3.6. Configuration: Tx Conducted, CH 8 151.940 MHz, 12.5 KHz, Low power





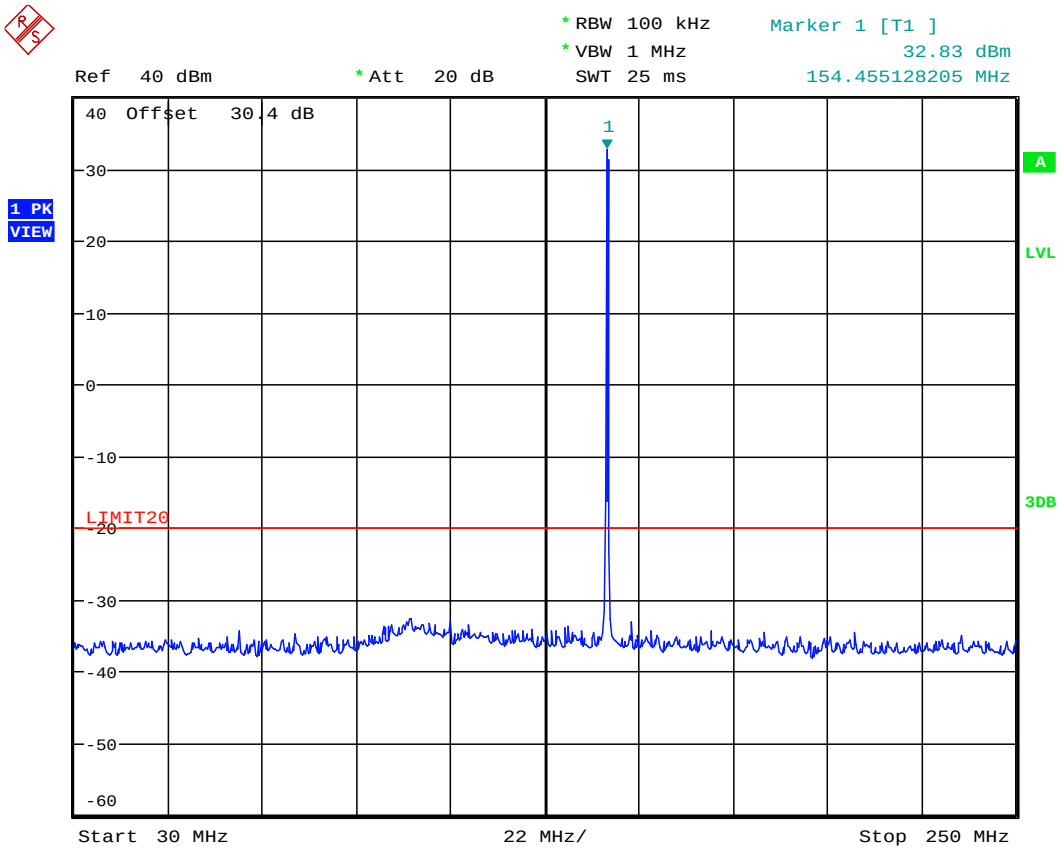
Date: 6.MAY.2022 14:51:15



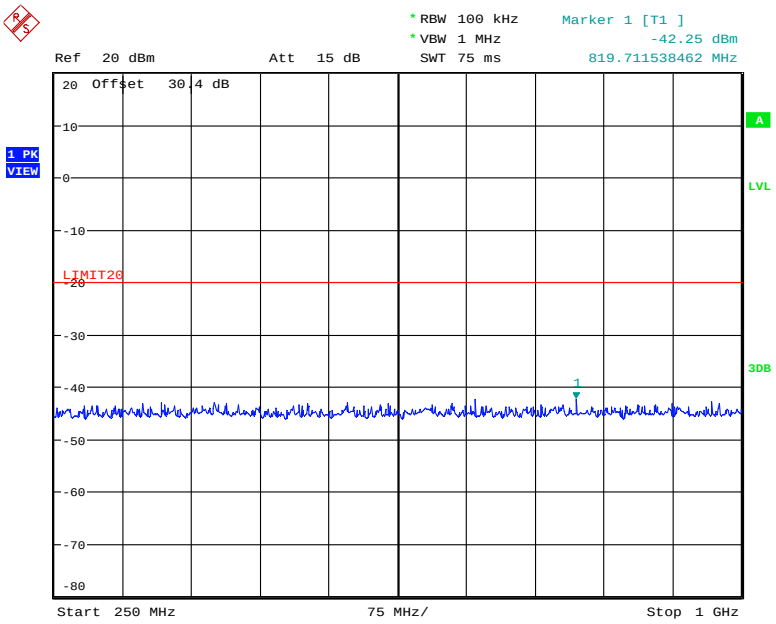
Date: 6.MAY.2022 15:01:32

High Power

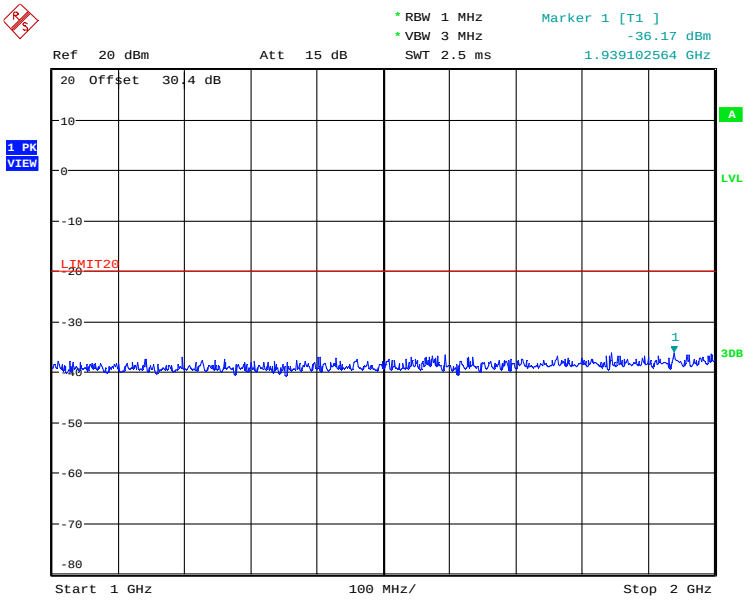
5.5.3.7. Configuration: Tx Conducted, CH 3 154.570 MHz, 25 KHz, High power



Date: 6.MAY.2022 14:31:57

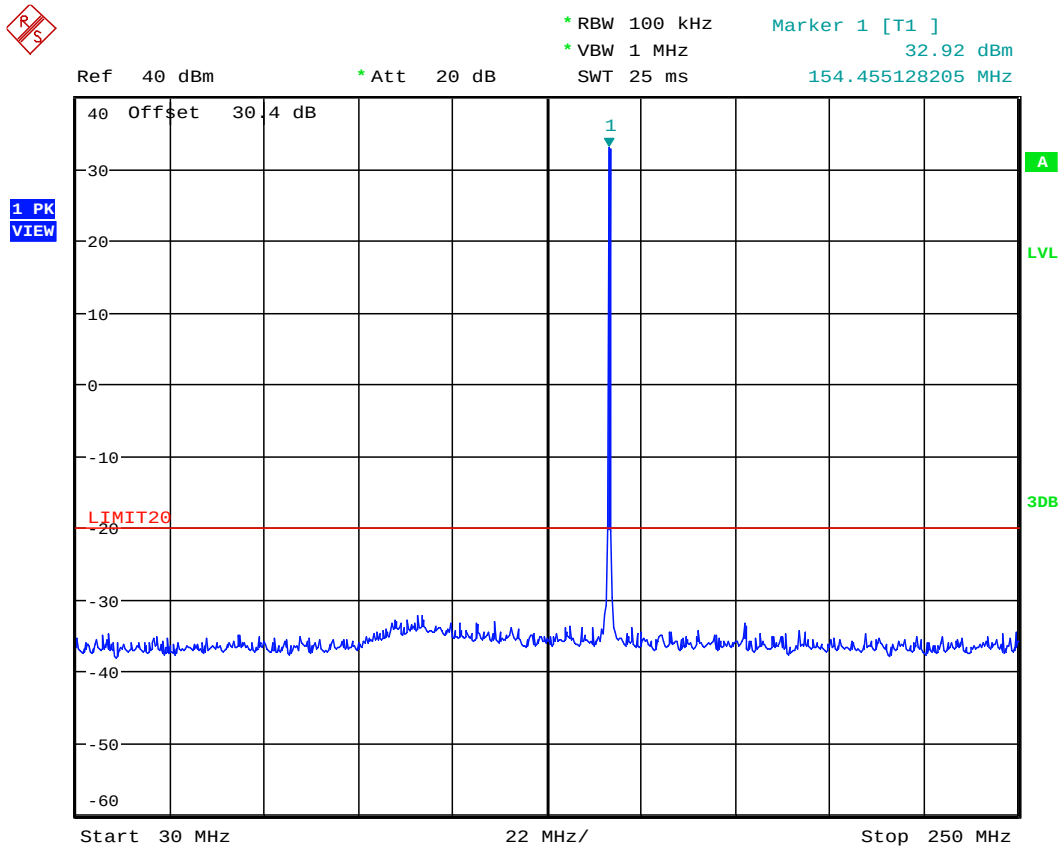


Date: 6.MAY.2022 14:42:32

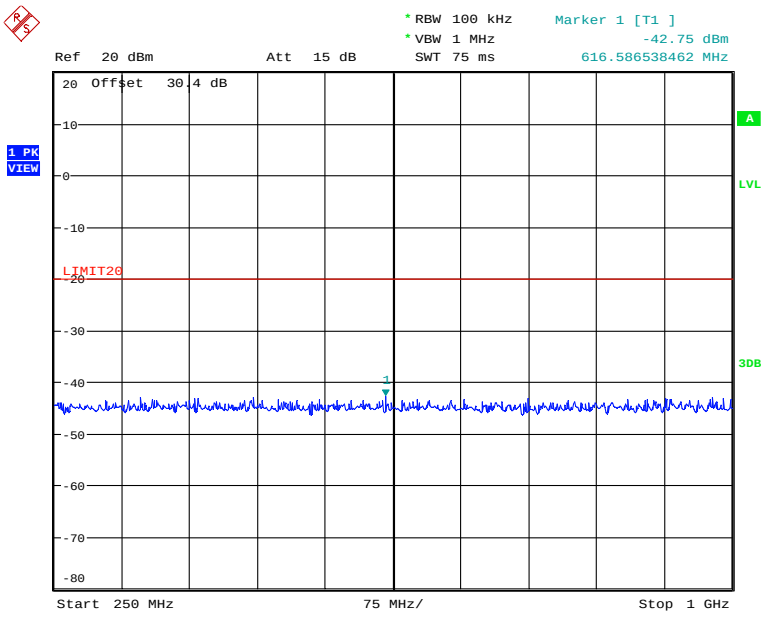


Date: 6.MAY.2022 14:52:52

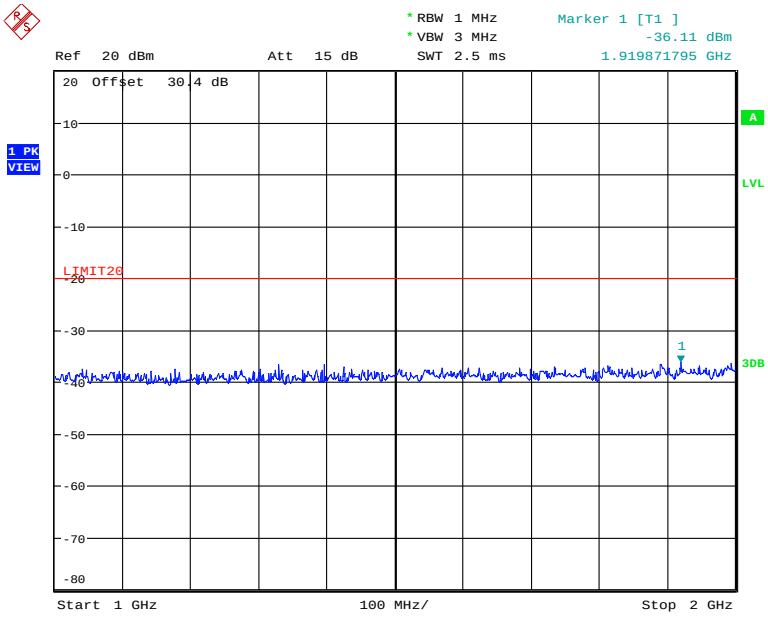
5.5.3.8. Configuration: Tx Conducted, CH 9 154.600 MHz, 25 KHz, High power



Date: 6.MAY.2022 14:33:49



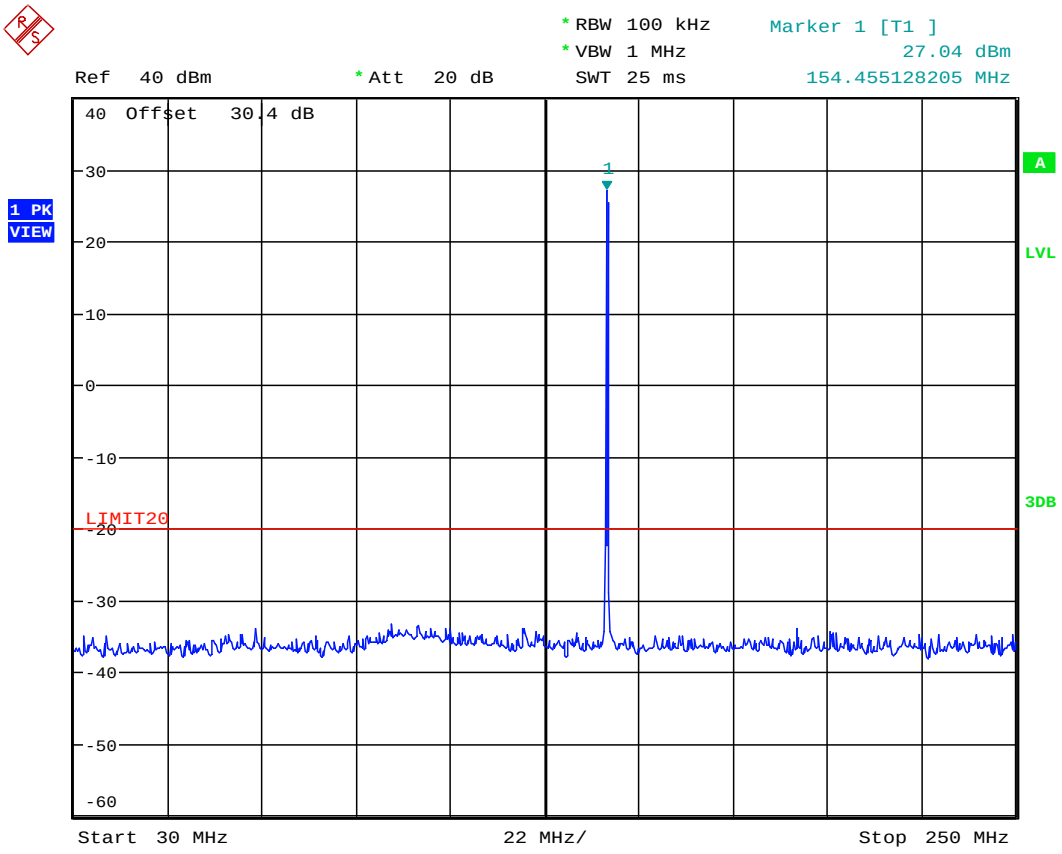
Date: 6.MAY.2022 14:44:13



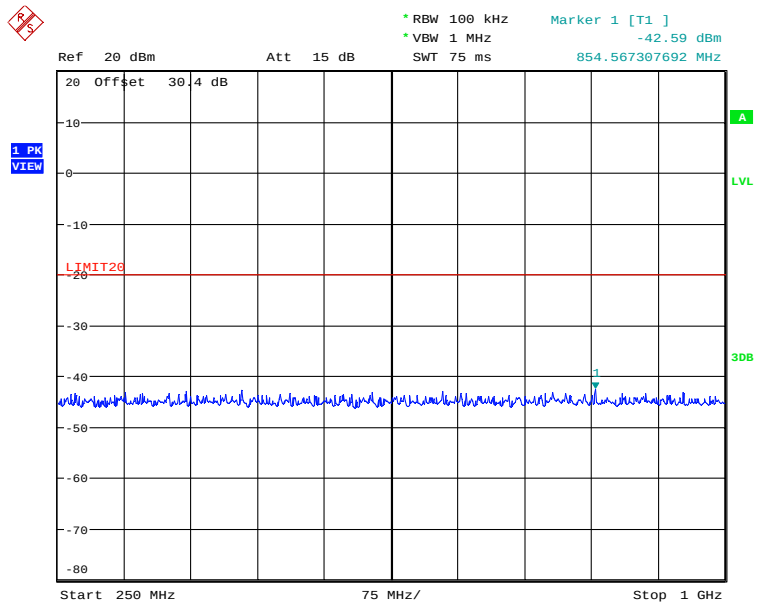
Date: 6.MAY.2022 14:54:29

Low Power

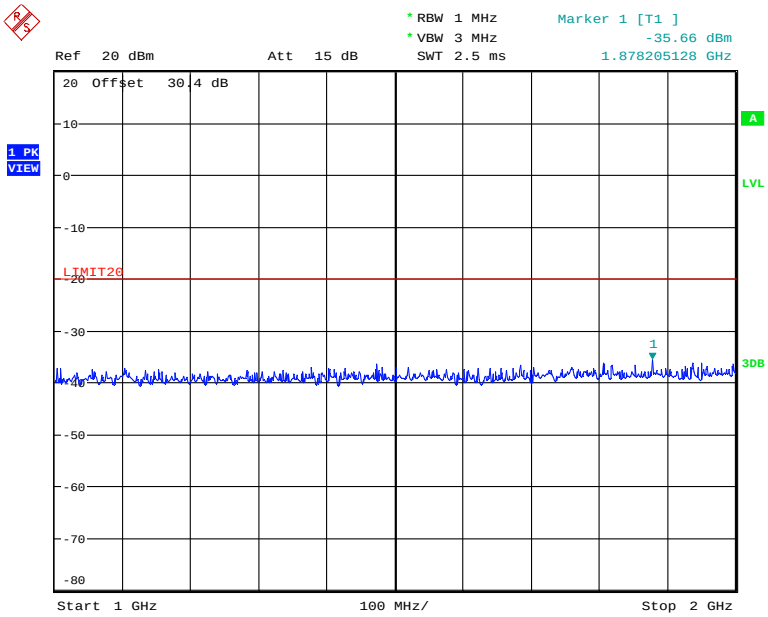
5.5.3.9. Configuration: Tx Conducted, CH 4 154.570 MHz, 25 KHz, Low power



Date: 6.MAY.2022 14:32:52

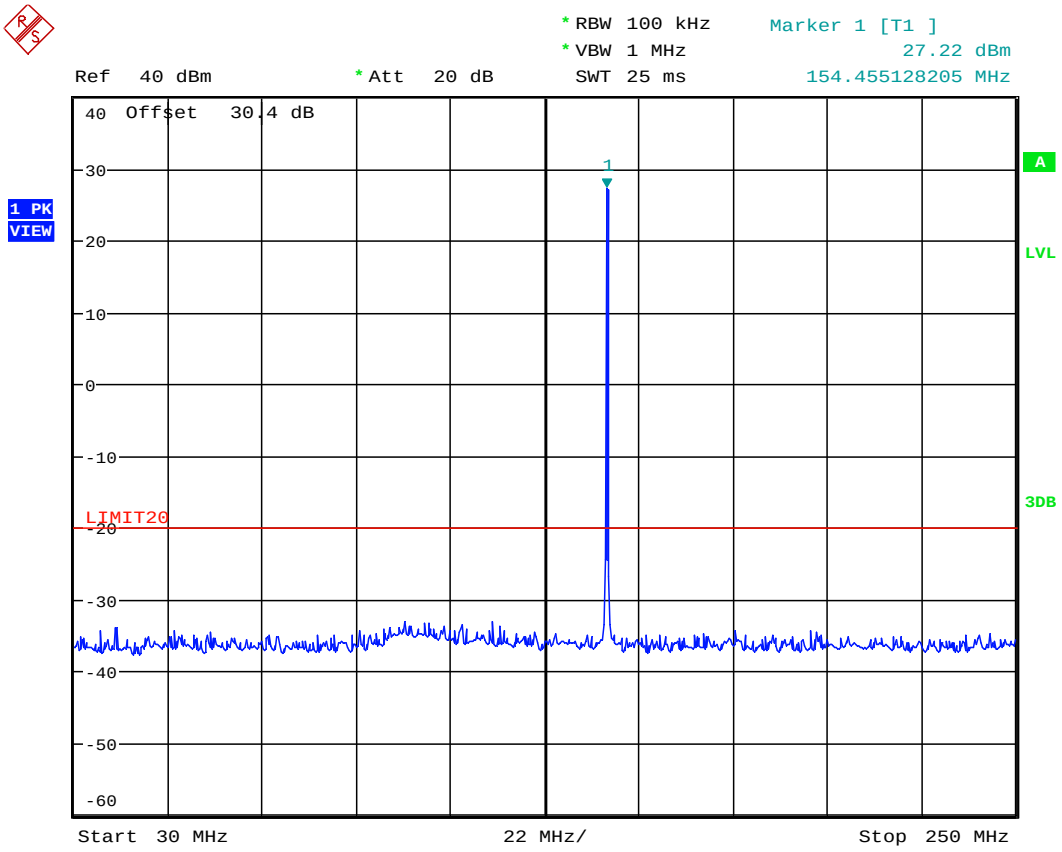


Date: 6.MAY.2022 14:43:17

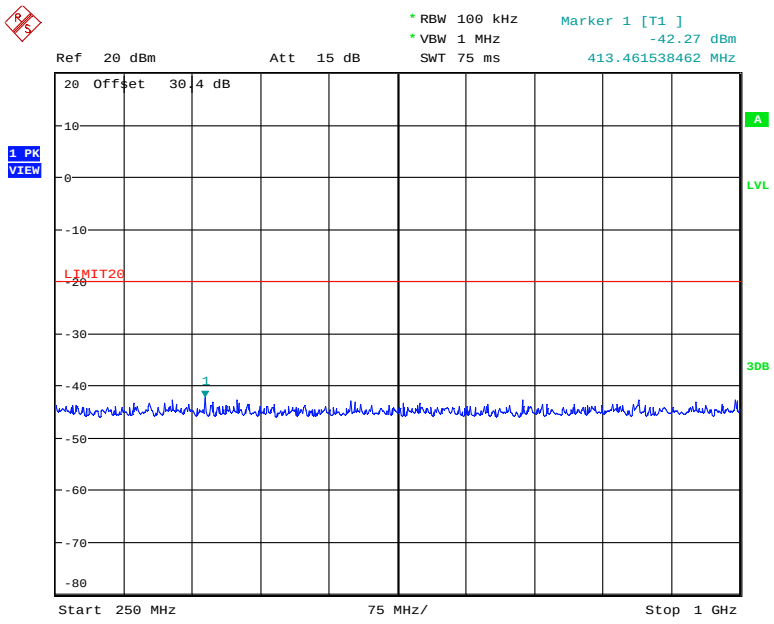


Date: 6.MAY.2022 14:53:37

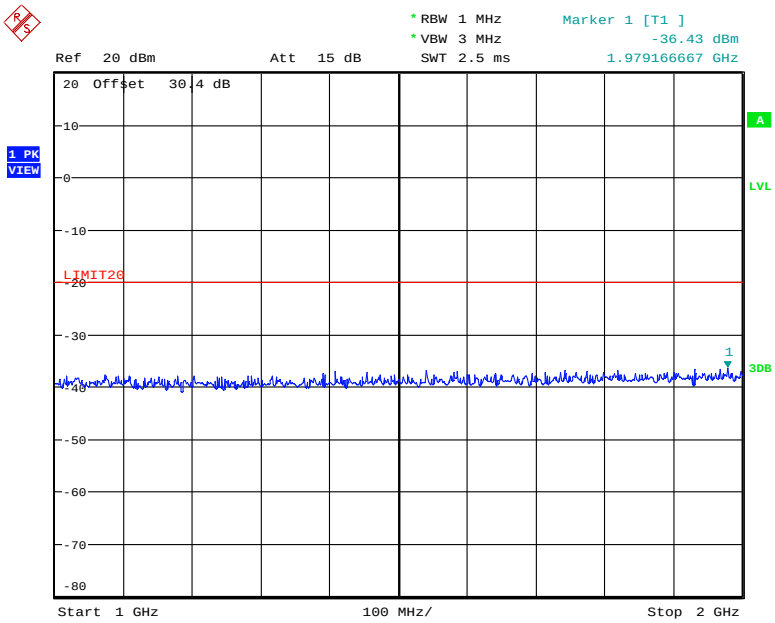
5.5.3.10. Configuration: Tx Conducted, CH 10 154.600 MHz, 25 KHz, Low power



Date: 6.MAY.2022 14:34:29



Date: 6.MAY.2022 14:45:12



Date: 6.MAY.2022 14:55:23

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 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: 20 dBm
- Tx Power: Max rated output

Test Frequency (MHz)	Frequency (MHz)	Peak Measurement. (dBuV/m)	Antenna Polarization (V/H)	ERP Measurement (dBm)	ERP Limit (dBm)	Margin (dB)
151.82	No significant Emissions					
151.88	No significant Emissions					
151.94	No significant Emissions					
154.57	No significant Emissions					
154.6	No significant Emissions					

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 ±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 ±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.

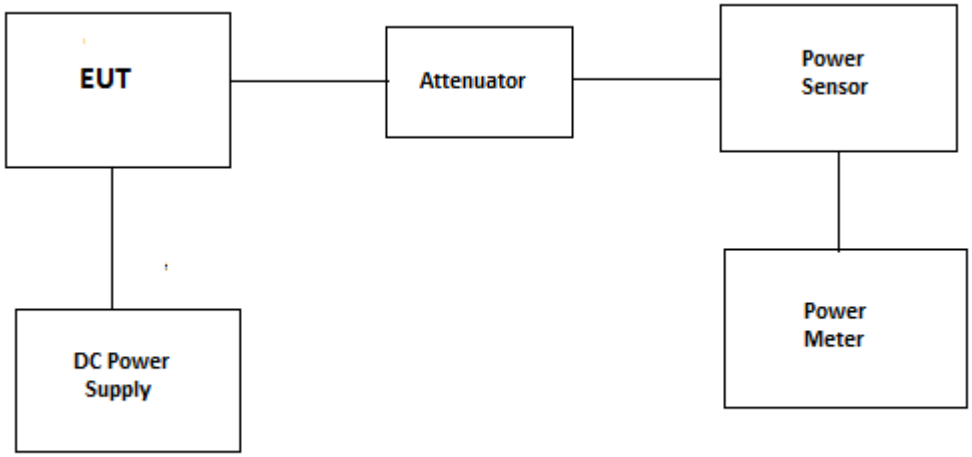
5.7.3. Test Data

Center Frequency:	151.820 MHz
Full Power Level:	1.82W
Frequency Tolerance Limit (Worst Case):	5 ppm or 759 Hz
Max. Frequency Tolerance Measured:	-1.01ppm or -154 Hz
Input Voltage Rating:	7.5 VDC

Ambient Temperature (°C)	**Frequency Drift (Hz)**		
	Supply Voltage (Nominal) 7.5 VDC	**Supply Voltage (85% of 13.8 VDC) 6.2 VDC**	**Supply Voltage (115% of 28 VDC) 8.625 VDC**
-30	-154	--	--
-20	-138	--	--
-10	-93	--	--
0	-58	--	--
10	-60	--	--
20	-80	-78	-85
30	-86	--	--
40	-95	--	--
50	-96	--	--
60	-100	--	--

EXHIBIT 6. Block Diagram & Test Equipment List:

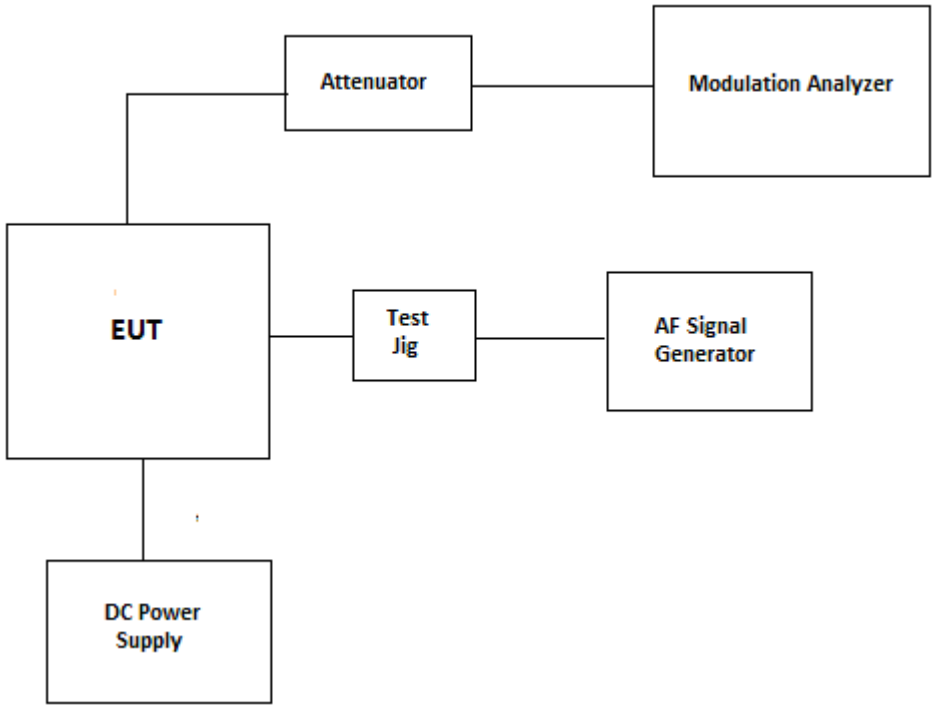
6.1. Conducted Power



Test Date: May 05, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Power Meter	HP	436A	2709A27515	100KHz-sensor dependant	17 Jul 2022
Power Sensor	HP	8482A	US37295943	0.1MHz-4.2GHz	28 Mar 2023
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	4142058	---	01 Oct 2022

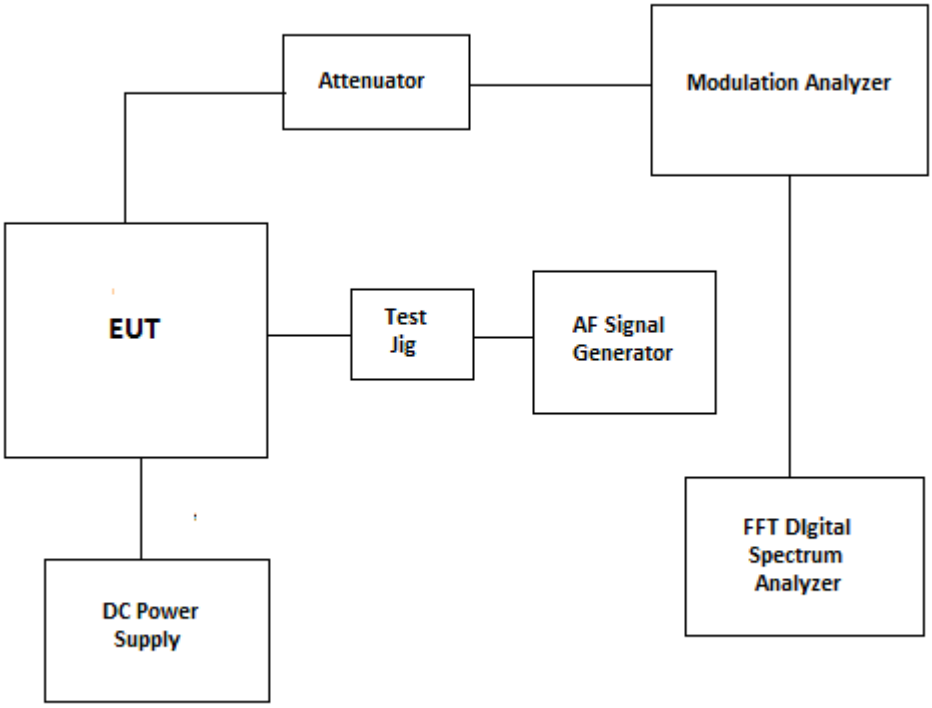
6.2. Modulation Limit



Test Date: May 05, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Modulation Analyzer	HP	HP-8901B	3226A04606	150KHz-1300MHz	29 Mar 2024
AF Signal Generator	HP	HP-8920B	US39064699	30MHz-1GHz	29 Mar 2024
Digital Voltmeter	HP	3456A	2015A04523	--	08 Feb 2024
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	4142058	---	01 Oct 2022

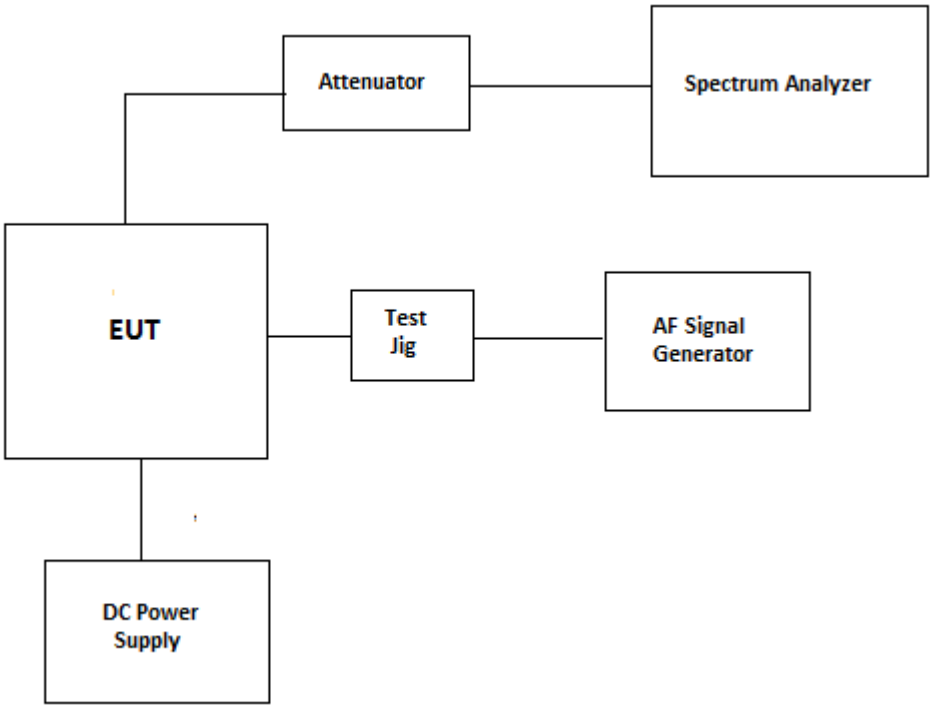
6.3. Audio Frequency Response



Test Date: May 05, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Modulation Analyzer	HP	HP-8901B	3226A04606	150KHz-1300MHz	29 Mar 2024
AF Signal Generator	HP	HP-8920B	US39064699	30MHz-1GHz	29 Mar 2024
Digital Voltmeter	HP	3456A	2015A04523	--	08 Feb 2024
FFT Digital Spectrum Analyzer	Advantest	R9211E	8202336	10MHz-100KHz	02 Nov 2022
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	4142058	---	01 Oct 2022

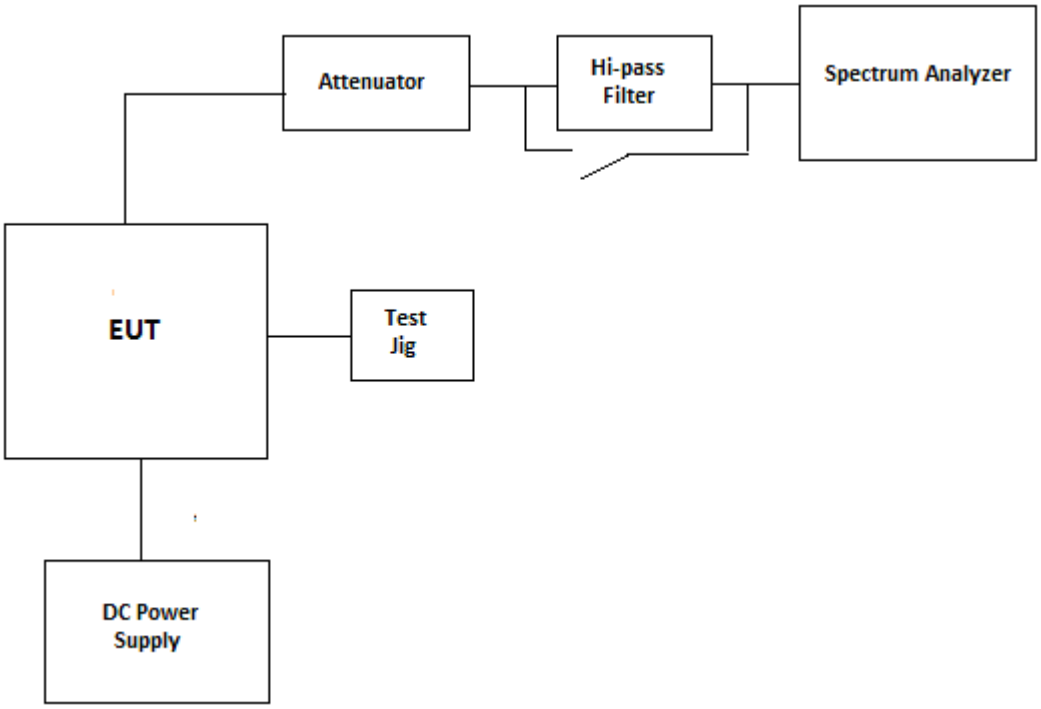
6.4. 99% OBW and Mask



Test Date: May 06, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	20 Sep 2023
AF Signal Generator	HP	HP-8920B	US39064699	30MHz-1GHz	29 Mar 2024
Digital Voltmeter	HP	3456A	2015A04523	---	08 Feb 2024
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	4142058	---	01 Oct 2022

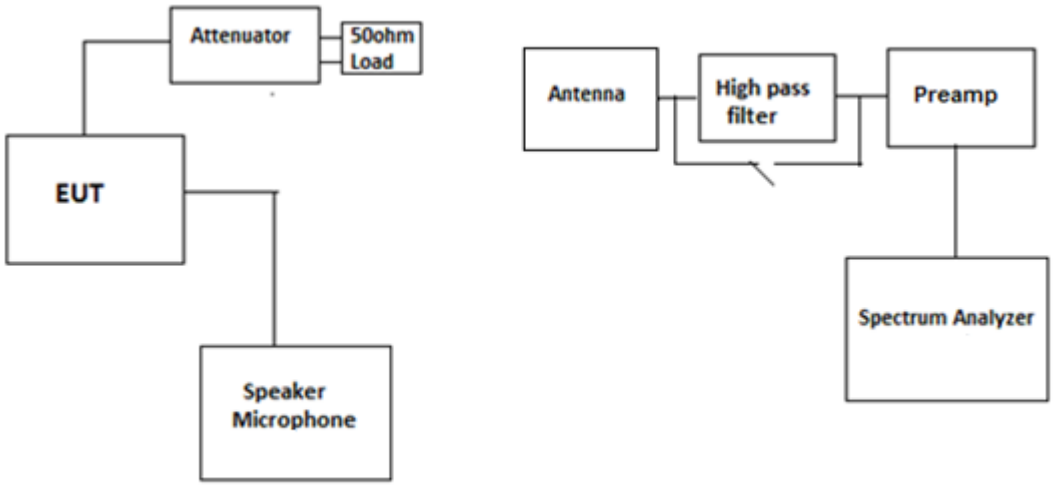
6.5. Tx Conducted Emission



Test Date: May 06, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	20 Sep 2023
AF Signal Generator	HP	HP-8920B	US39064699	30MHz-1GHz	29 Mar 2024
Hi-pass filter	Mini-Circuit	SHP-250	--	Cut off 250MHz	Cal before use
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	4142058	---	01 Oct 2022

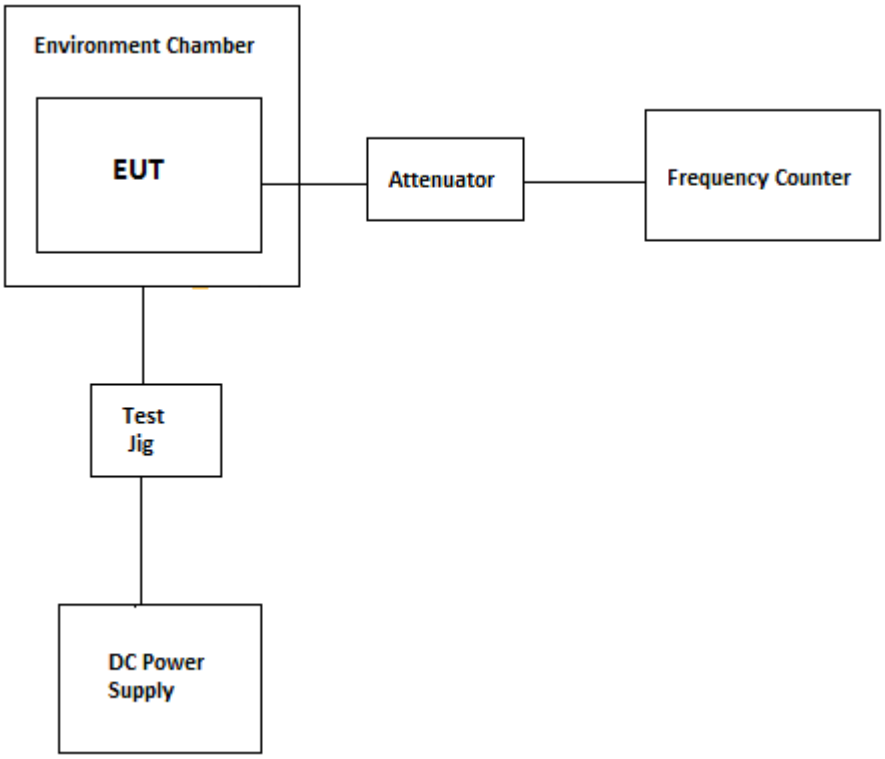
6.6. TX Radiated



Test Date: May 09, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20Hz-26.5GHz	20 Sep 2023
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20Hz-40GHz	01 Sep 2022
Biconilog Antenna	EMCO	3142C	00034792	26-2000MHz	16 May 2022
Log Periodic Antenna	ETS	3148	00023845	200-2000MHz	14 Apr 2023
Horn Antenna	ETS	3117	00119425	1-18GHz	20 Jan 2024
Horn Antenna	ETS	3115	5955	1-18GHz	12 Oct 2022
Preamplifier	Com-Power	PAM-118A	551016	500MHz-18GHz	04 Mar 2023
Preamplifier	Com-Power	PAM-103	18020181	1-1000MHz	04 Mar 2023
Hi-pass filter	Mini-Circuit	SHP-250	--	Cut off 250MHz	Cal before use
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC-18GHz	Cal before use
Load(50ohm)	Mini-Circuits	KARN-50+	--	DC-18GHz	Cal before use

6.7. Frequency Stability



Test Date: May 10~11, 2022

Test Instrument	Manufacturer	Model No	Serial No	Frequency Range	Cal Due date
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177° C	25 Aug 2023
Frequency Counter	EIP	545A	2683	10MHz-1GHz	08 Sep 2022
Attenuator(10dB)	Aeroflex\Weinschel	46-10-34	BS4336	DC-18GHz	Cal before use
Attenuator(20dB)	Narda	26298	A577	DC-1GHz	Cal before use
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	----
Multimeter	Fluke	8842A	5436283	---	03 Aug 2023

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	±0.31	±0.62
Occupied Band and Emission Mask	±0.62	±0.63
Conducted Out of Band/Spurious Emissions	±0.36	±0.72
Radiated Spurious Emissions	30 MHz – 1 GHz	
	±2.10	±4.20
	1 – 18 GHz	
	±1.35	±2.70
Frequency Stability	Below 1 GHz	
	±0.60	±1.20
	Above 1 GHz	
	±0.50	±1.00

END OF REPORT