(2) ANSI C63.26-2015 Clause 5.1.2

5.1.2 Number of fundamental frequencies to be tested in EUT transmit band

5.1.2.1 General requirement

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

[24] See 47 CFR 2.1057.

Table 2—Number of frequencies to be tested

Frequency range over which EUT operates	Number of frequencies	Location in frequency range of operation
1 MHz or less	1	Middle
1 MHz to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

(3) KDB 935210 D02 APPENDIX D/Table D.3

Table D.3 – Various Part 90 PLMRS band allocations, rule parts/sections, and service types for Section 90.219 purposes (for info only – see rules for details, also KDB Publication 634817 [R14])

F_L (MHz)	–	F_L (MHz)	Rule(s)	Misc. Notes
150	–	150.05	Federal (non-FCC)	
150.05	–	150.8	90.265	
150.8	–	162.0125	90	
162.0125	–	173.2	90.265	
173.2	–	173.4	90	
173.4	–	174	Federal (non-FCC)	
406.1	–	420	90.265	
420	–	421	ULS presently shows no licensees for 420-420.9 MHz	
421	–	430	90	
430	–	450	Not available under 90 Subparts B, C land mobile service	
450	–	470	90 (selected bands)	
470	–	512	90	
746	–	757	27.5(b)(3) Block C; 90 not available	
757	–	758	27.5(b)(1) Block A; 90 not available	
758	–	768	90-R, Public Safety (PS) Broadband (FirstNet)	B9B (LTE)
768	–	769	PS Guardband	
769	–	775	PS Narrowband	
775	–	776	27.5(b)(2) Block B; 90 not available	
776	–	787	27.5(b)(3) Block C; 90 not available	
787	–	788	27.5(b)(1) Block A; 90 not available	
788	–	798	90-R, Public Safety (PS) Broadband (FirstNet)	B9B (LTE)
798	–	799	PS Guardband	
799	–	805	PS Narrowband	
805	–	806	27.5(b)(2) Block B; 90 not available	
806	–	809	90 NPSPAC (PS) [90.617(a)(1)]	B9B/B9A

The EUT will utilize bands: 450MHz ~ 512MHz

10.1.2. Result

This project is only reported and checked, the frequency range of this EUT meets the above regulatory requirements.

The following blanks

10.2. Input Signals

Test requirement: KDB 935210 D05 clause 4.1

10.2.1. Requirements

According to FCC regulations, KDB 935210 D05 clause 4.1 have relevant input signals requirements.

The procedures in this clause are specific to EUTs intended for operating in the Private Land Mobile Radio Services (PLMRS) and Public Safety Radio Services (PSRS)[5], which are governed under the provisions and requirements of the Part 90 rules (i.e., Section 90.219 applies).

Table 1 depicts signal types associated with PLMRS operations, which are to be considered as test signals to be used in performing compliance testing on PLMRS amplifiers, repeaters, and industrial boosters. Not all of the procedures in this clause will require using each of the signals listed in Table 1, because for

[5] As explained in § 90.16, Public Safety Radio Services is part of the Public Safety Radio Pool, also known as the Public Safety Pool.

many EUTs a CW tone can adequately model the narrowband signals typically encountered within these services. For EUTs supporting digitally modulated signals, the intended operating signal types should be tested (e.g., P25 Phase 1, P25 Phase 2, TETRA, etc.), especially for PSRS devices. Devices intended for use in 700 MHz Public Safety Broadband spectrum shall be tested using a representative band-limited AWGN signal (99 % OBW of 4.1 MHz) or the applicable signal type (e.g., LTE).

Table 1—Test signals for PLMRS devices

Emission Designator	Modulation	Occupied Bandwidth	Channel Bandwidth	Audio Frequency
16K0F3E	FM	16 kHz	25 kHz	1 kHz
11K3F3E	FM	11.3 kHz	12.5 kHz	1 kHz
4K00F1E	FM	4 kHz	6.25 kHz	1 kHz
N/A	CW	N/A	N/A	N/A

10.2.2. Result

Test Date (yy-mm-dd): 2024-02-17

Normal condition: Temp: 25.9°C, Humid: 54%, Atmospheric Pressure:101kpa

Supply Voltage: DC +24V

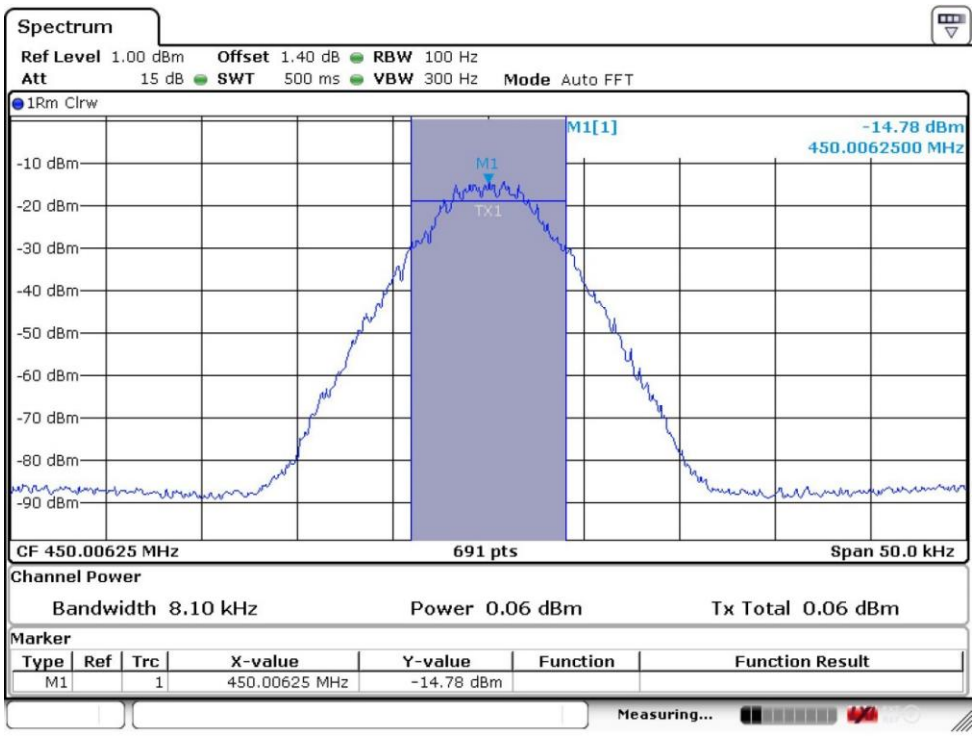
This project is only reported and checked.

The following blanks

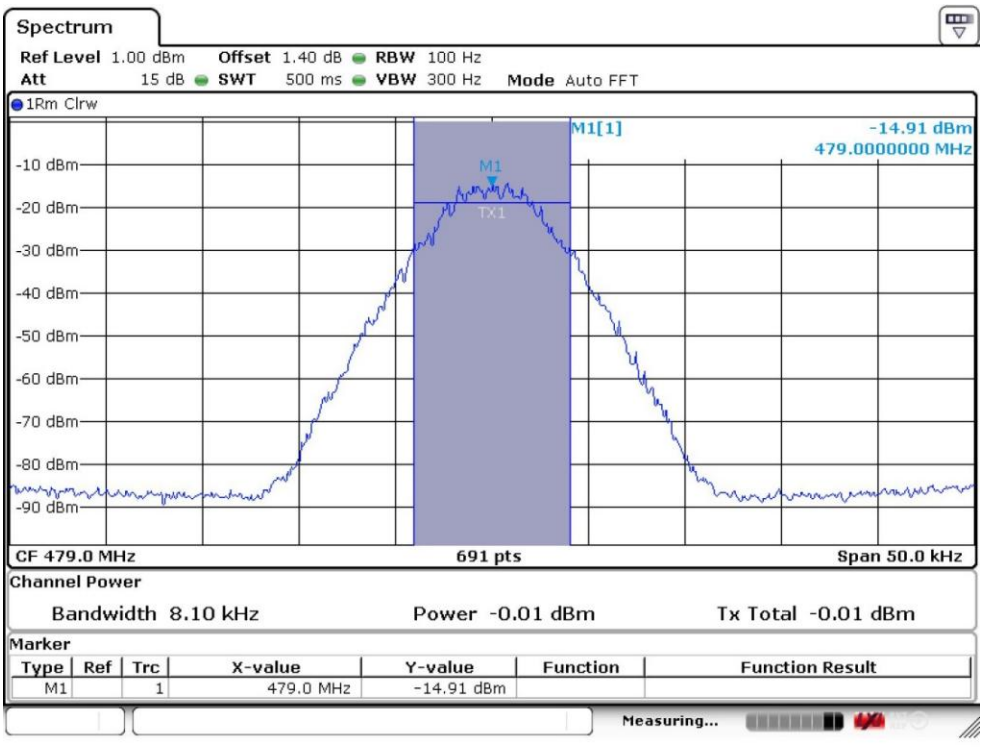
10.2.3. Input Signals screenshot

10.2.3.1. P25 Phase I(C4FM) mode

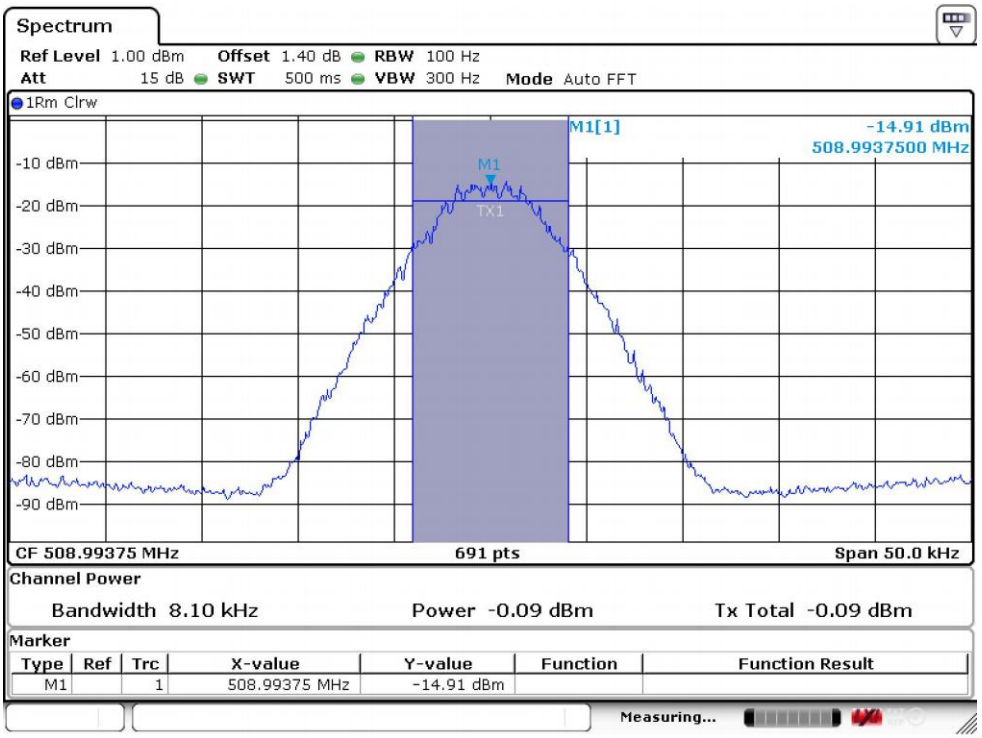
10.2.3.1.1. Downlink



Low Frequency: 450.00625MHz

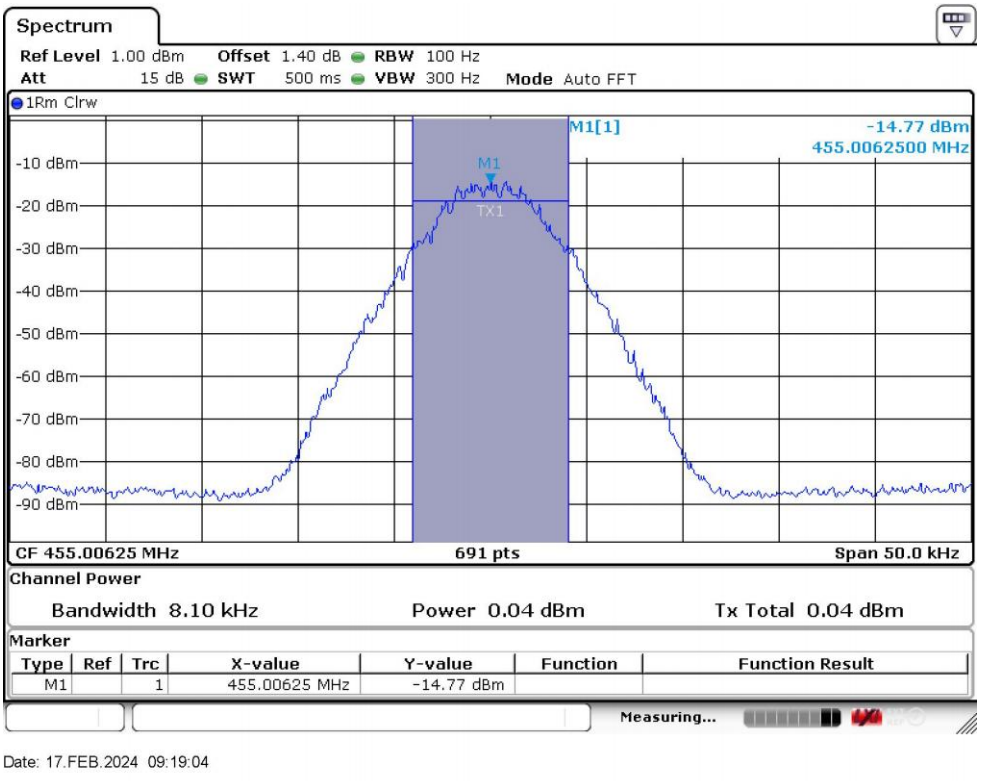


Middle Frequency: 479.0MHz

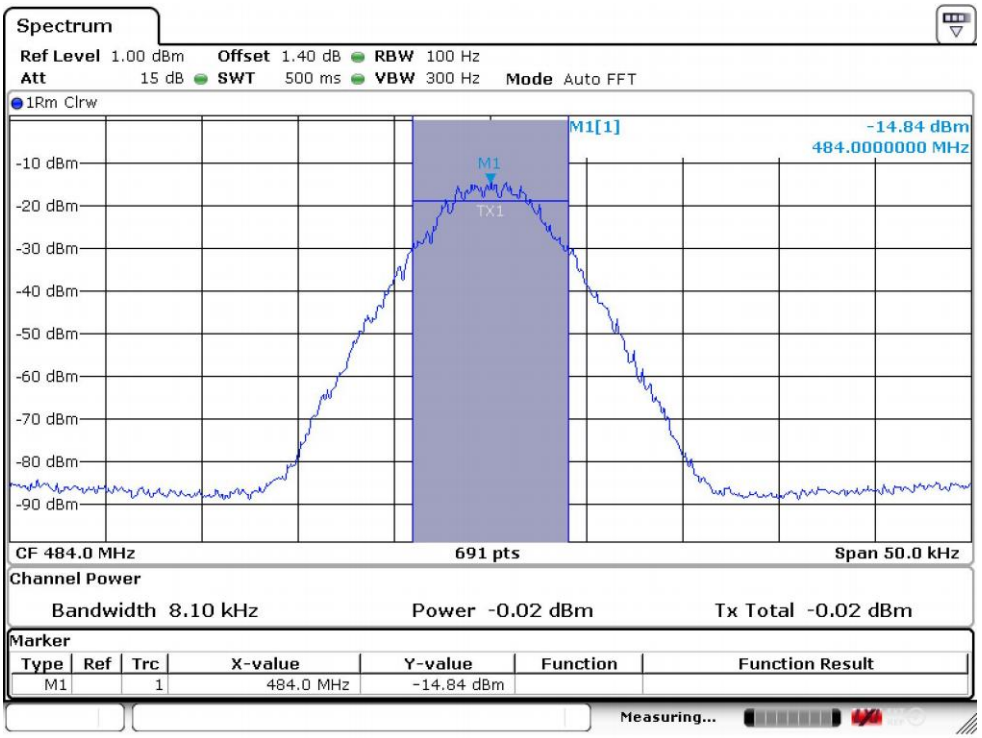


High Frequency: 508.99375MHz

10.2.3.1.2. Uplink

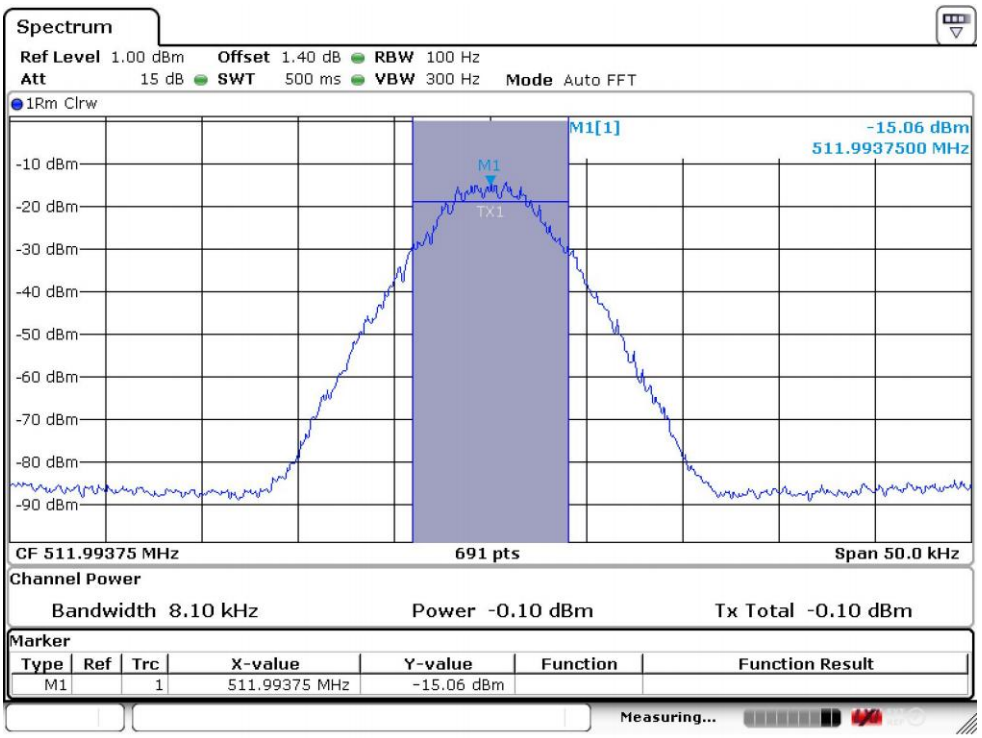


Low Frequency: 455.00625MHz



Date: 17.FEB.2024 09:19:43

Middle Frequency: 484.0MHz

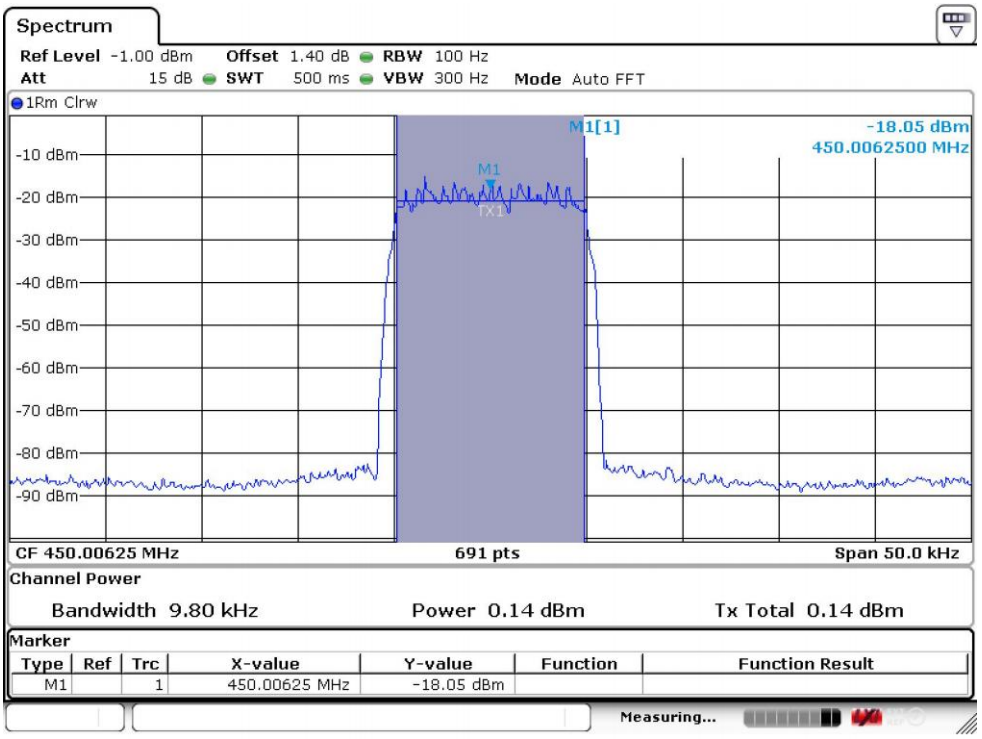


Date: 17.FEB.2024 09:20:10

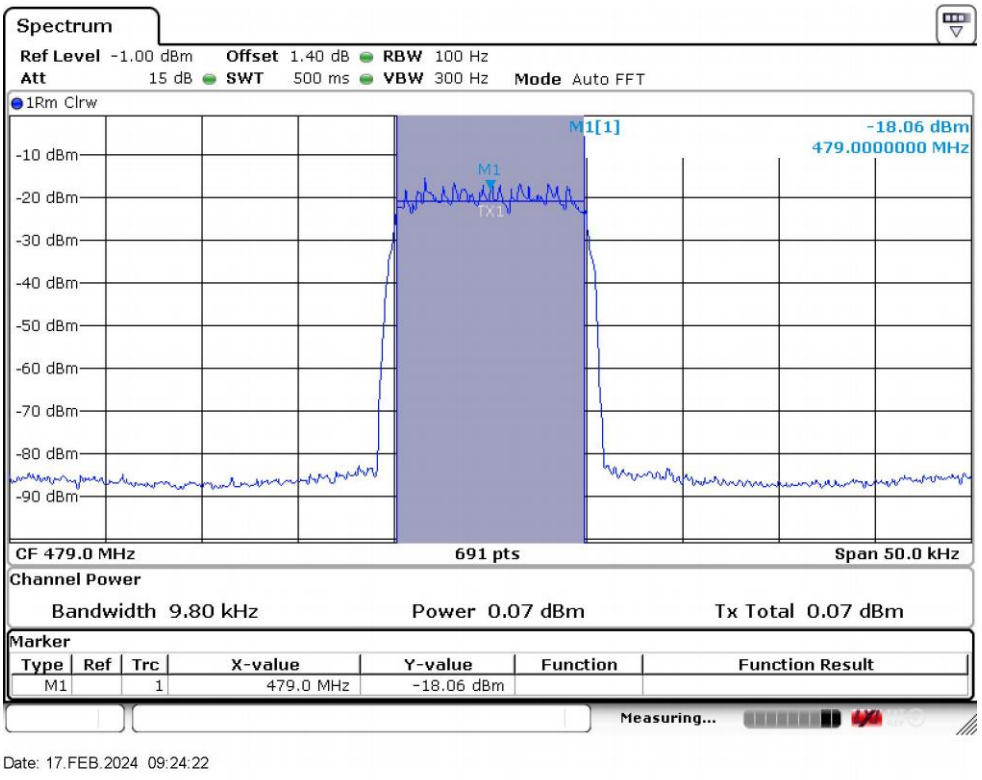
High Frequency: 511.99375MHz

10.2.3.2. P25 Phase II(H-DQPSK) mode

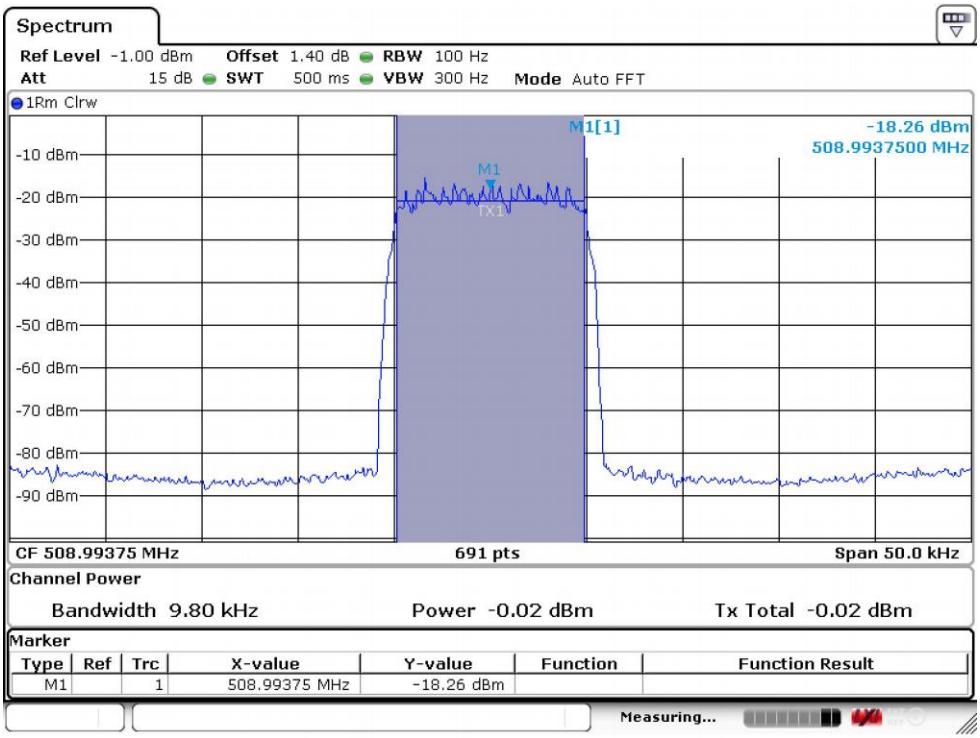
10.2.3.2.1. Downlink



Low Frequency: 450.00625MHz

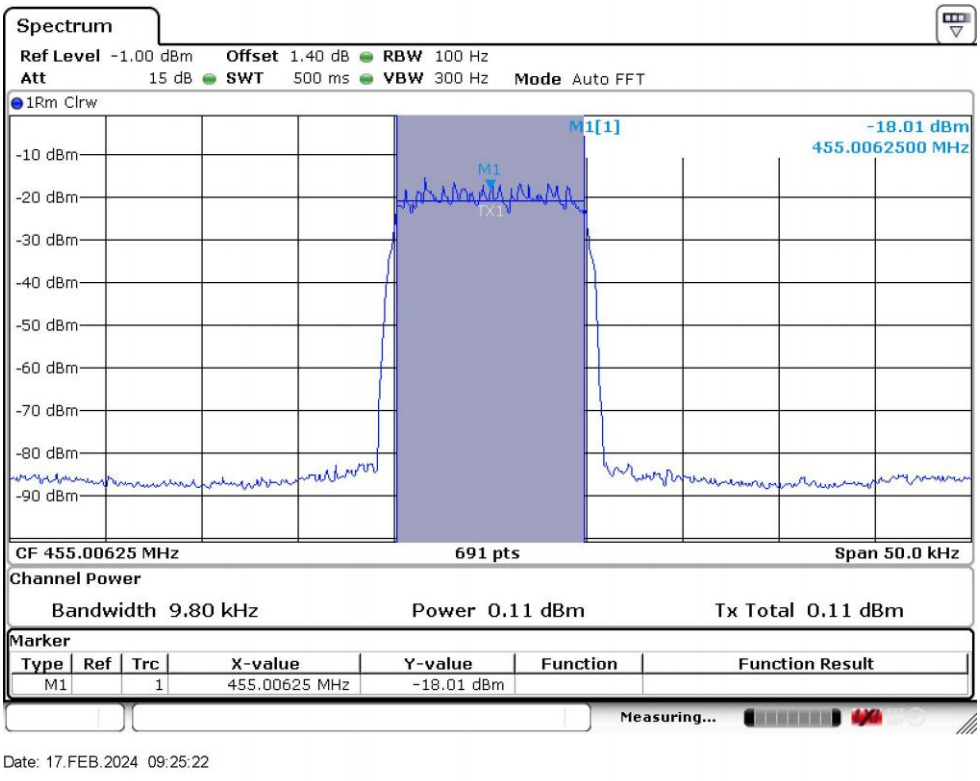


Middle Frequency: 479.0MHz

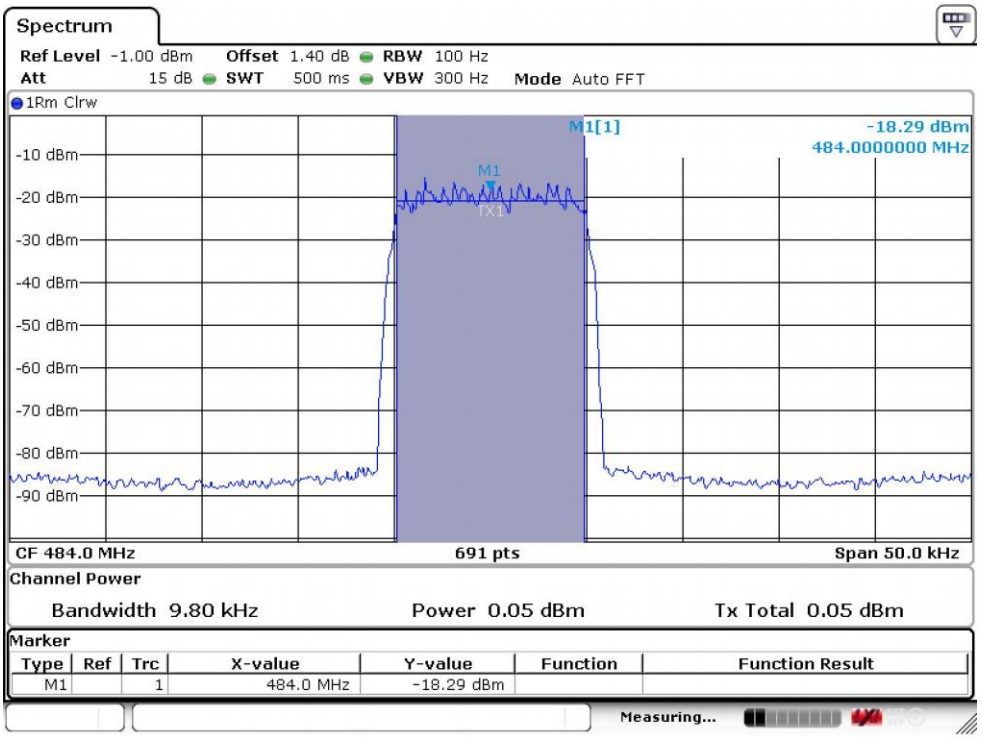


High Frequency: 508.99375MHz

10.2.3.2.2. Uplink

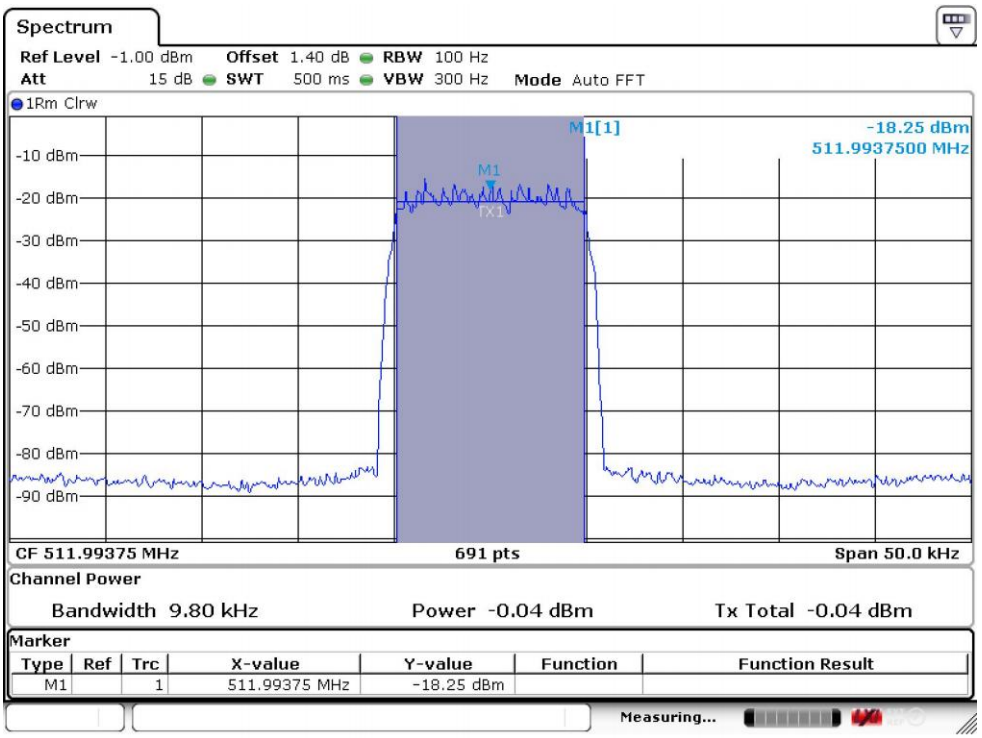


Low Frequency: 455.00625MHz



Date: 17.FEB.2024 09:25:45

Middle Frequency: 484.0MHz

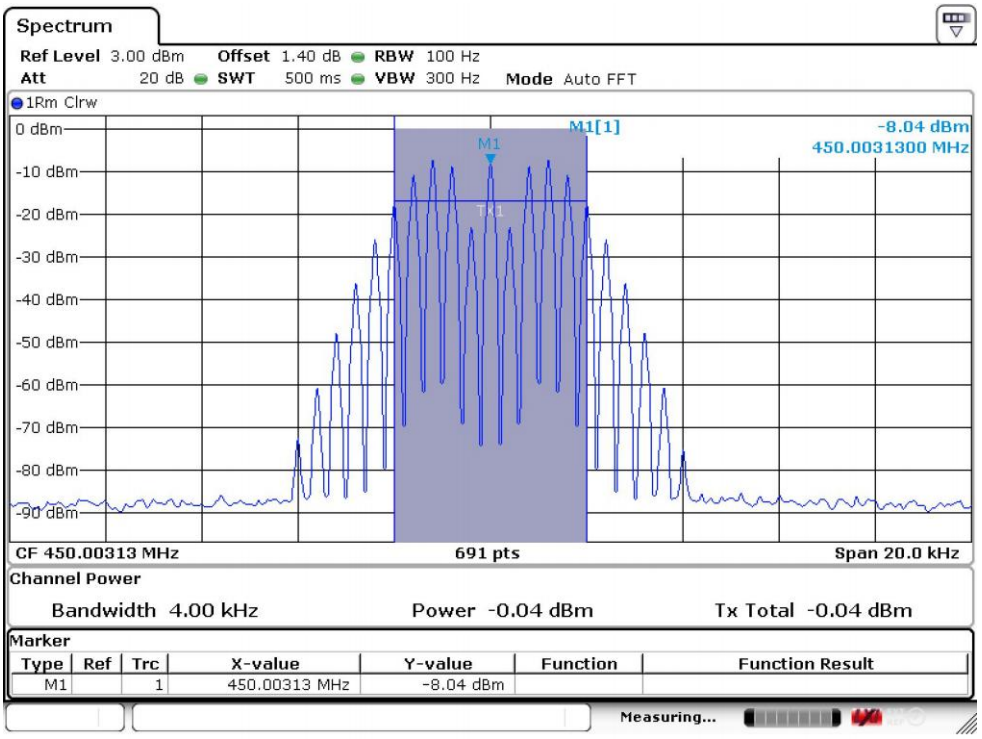


Date: 17.FEB.2024 09:26:14

High Frequency: 511.99375MHz

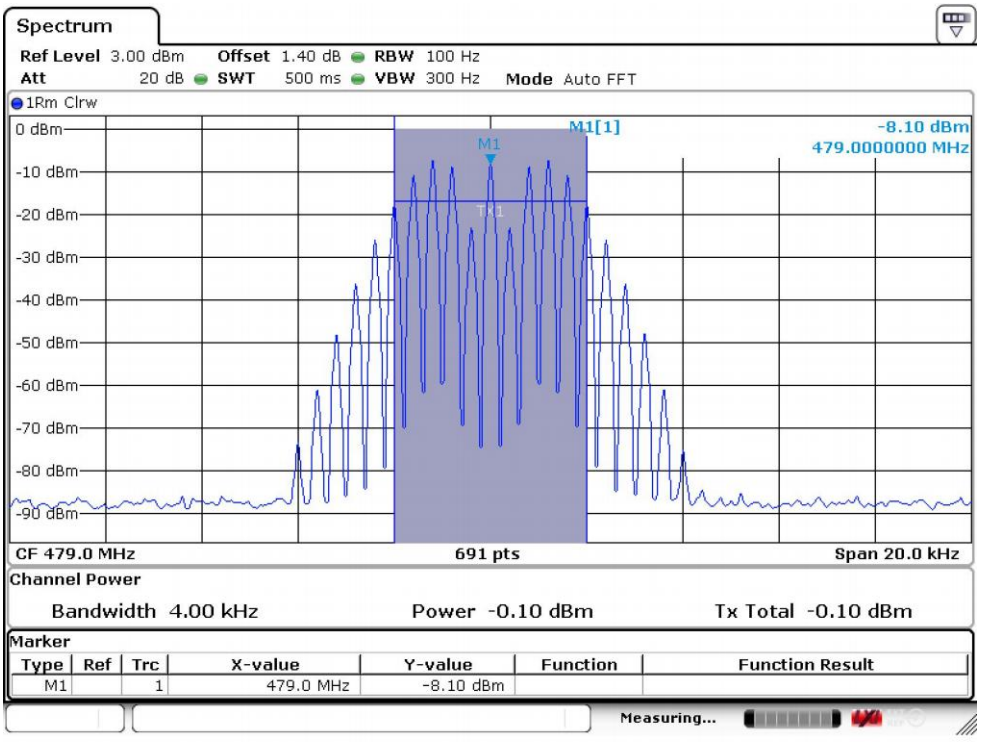
10.2.3.3. Analog FM (6.25kHz)

10.2.3.3.1. Downlink



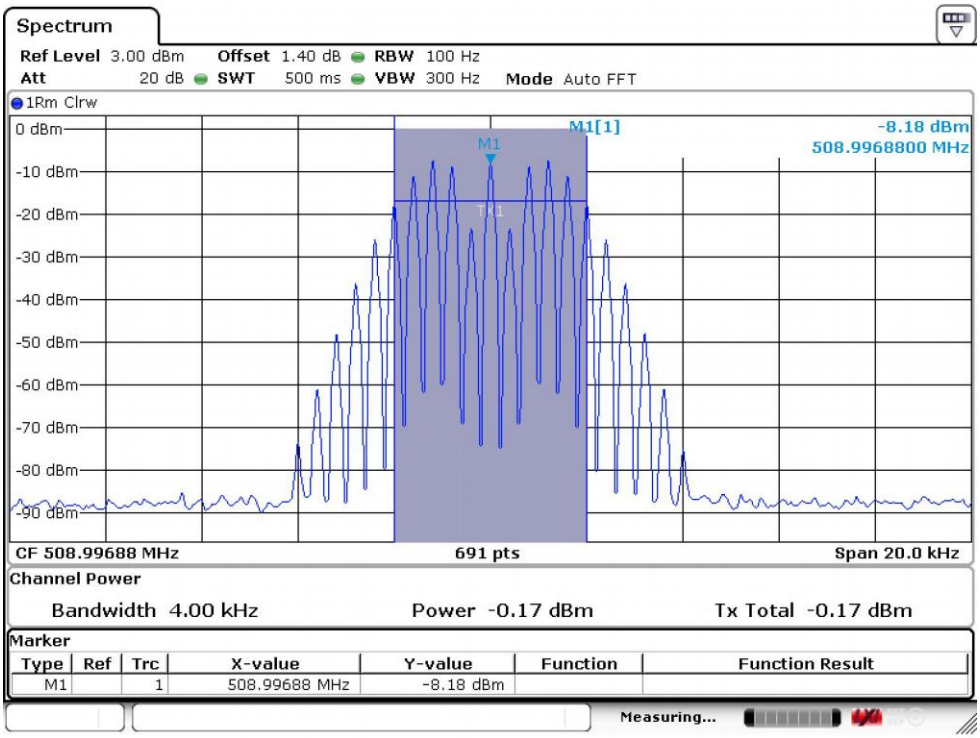
Date: 17.FEB.2024 09:51:14

Low Frequency: 450.00313MHz



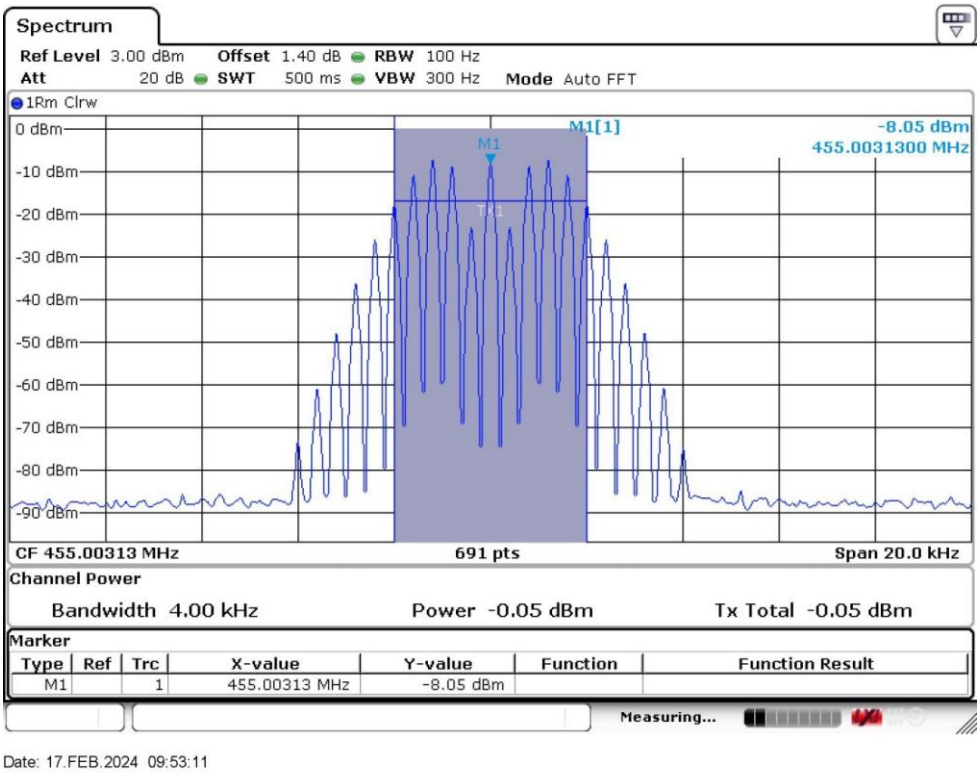
Date: 17.FEB.2024 09:51:52

Middle Frequency: 479.0MHz

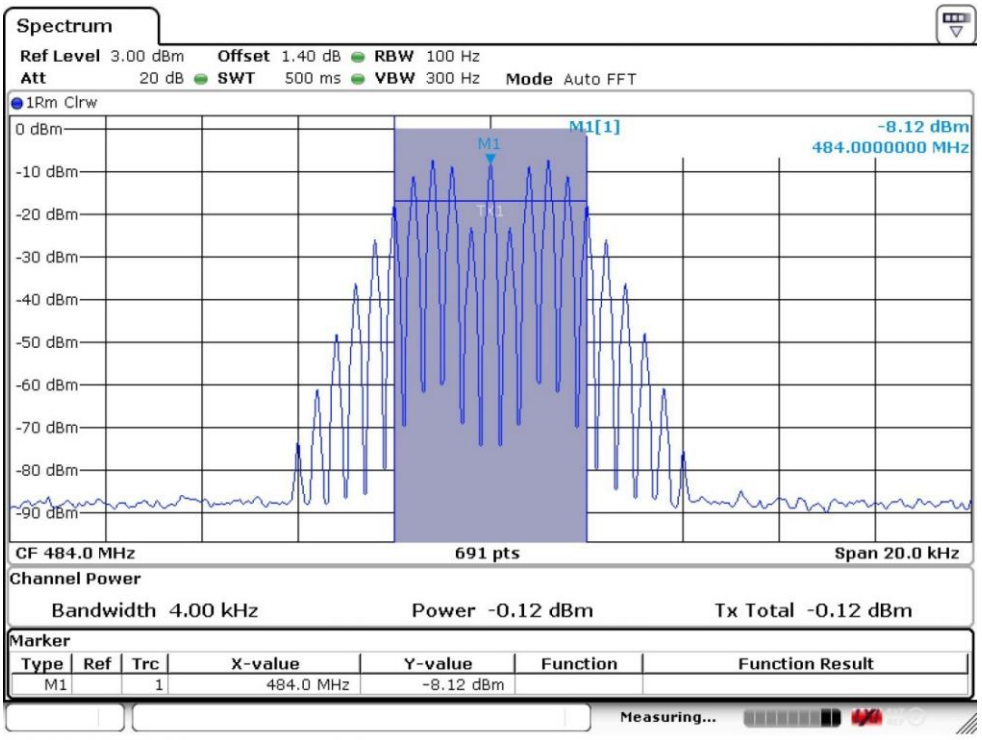


High Frequency: 508.99688MHz

10.2.3.3.2. Uplink

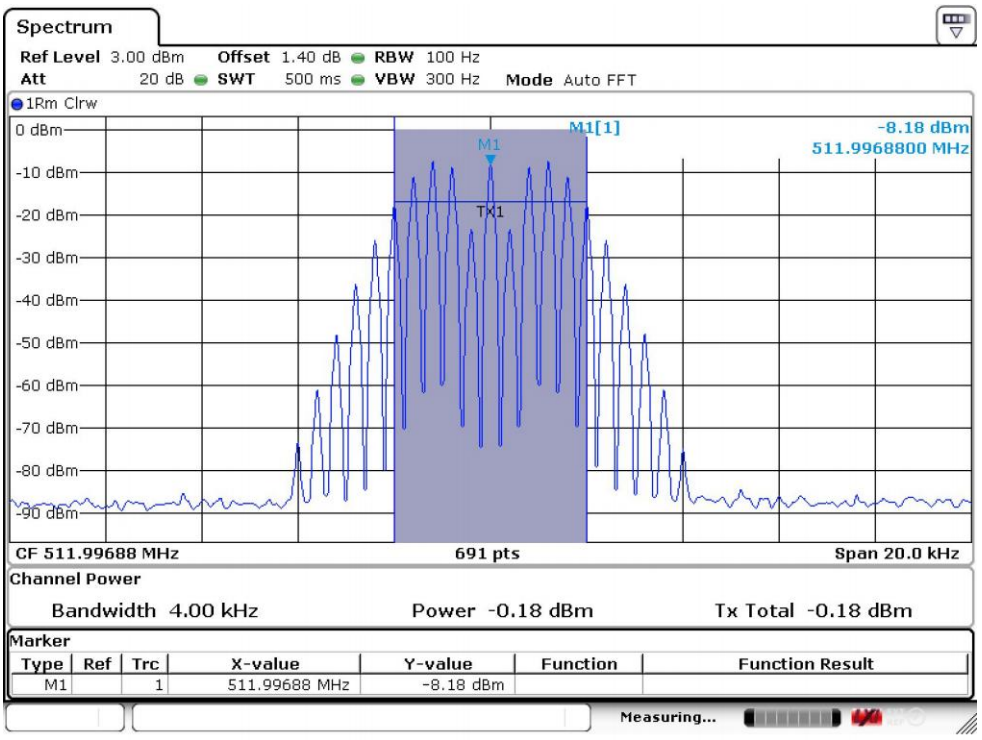


Low Frequency: 455.00313MHz



Date: 17.FEB.2024 09:53:39

Middle Frequency: 484.0MHz

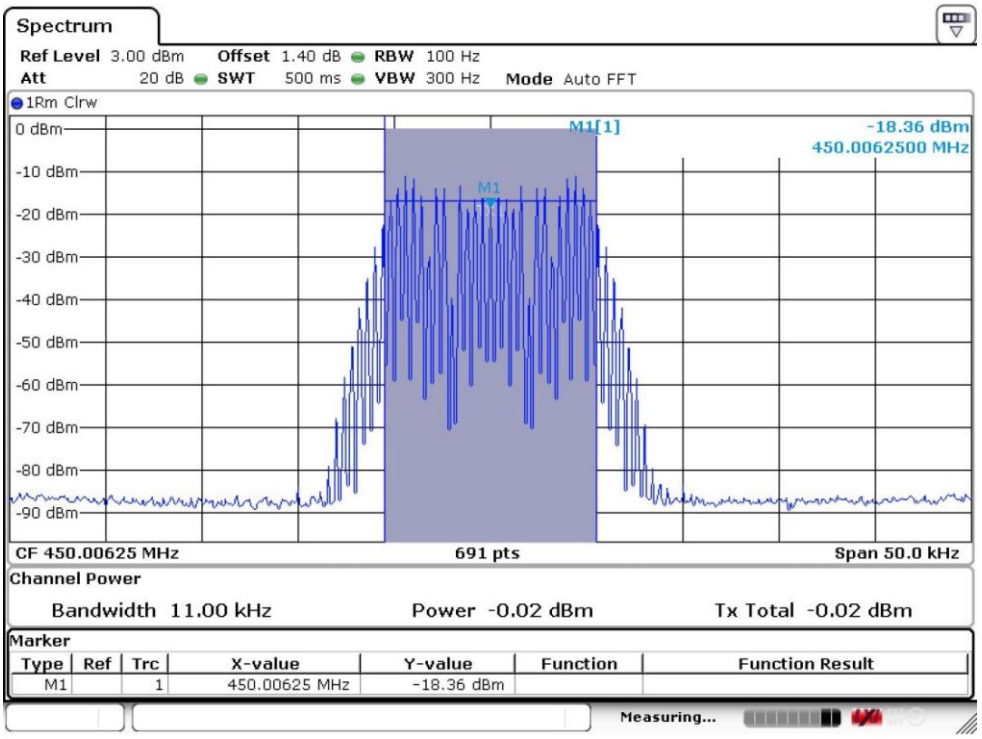


Date: 17.FEB.2024 09:54:10

High Frequency: 511.99688MHz

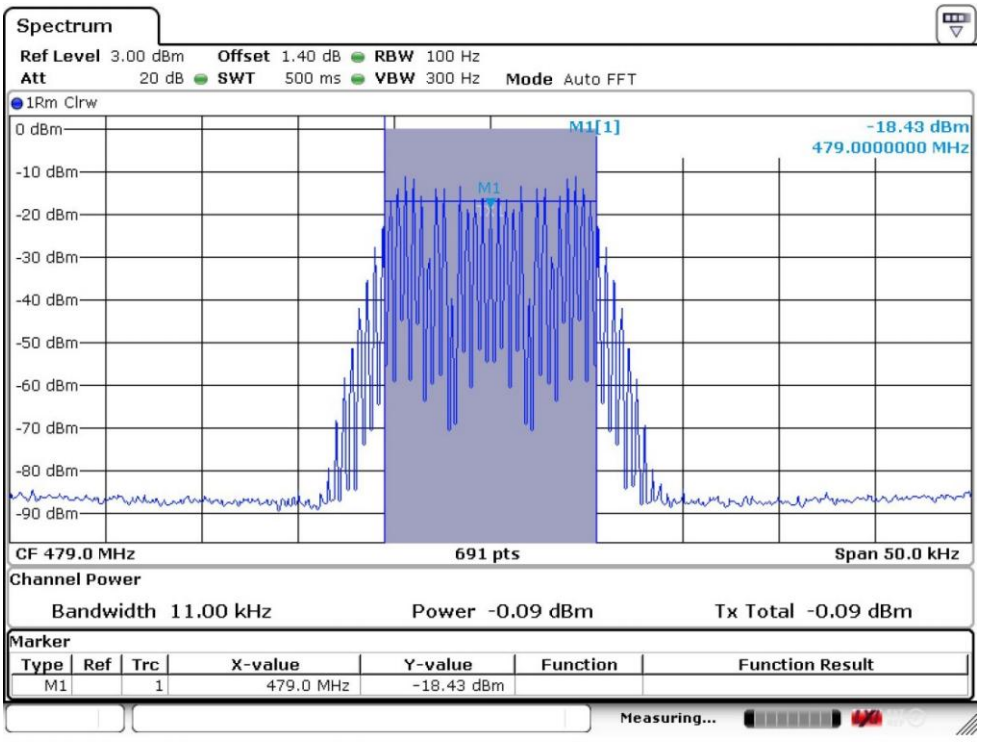
10.2.3.4. Analog FM (12.5kHz)

10.2.3.4.1. Downlink



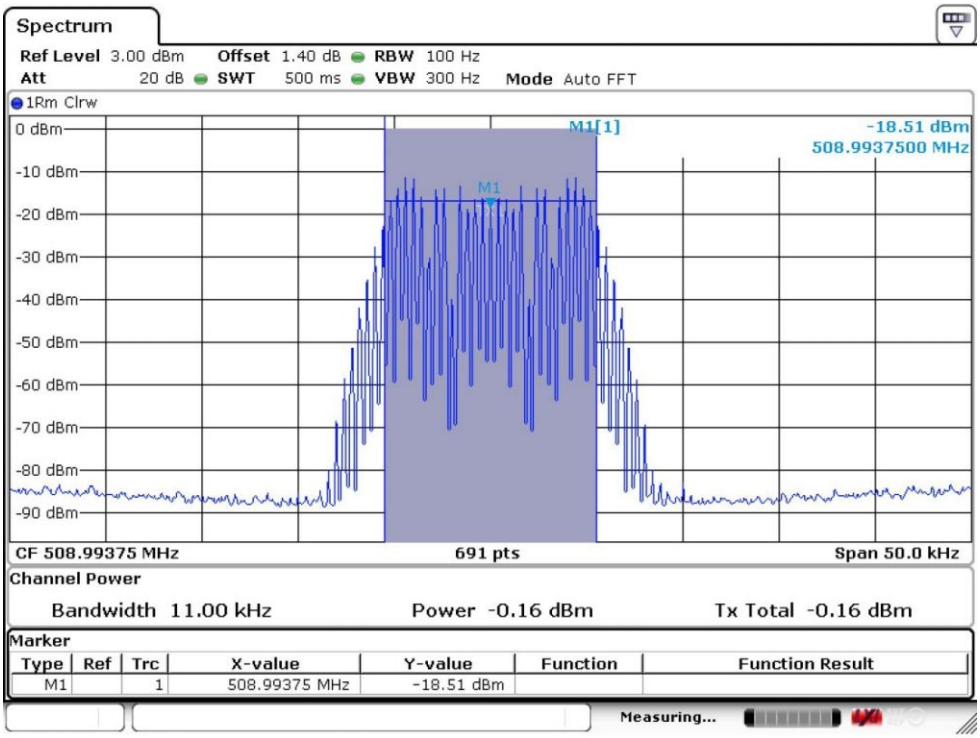
Date: 17.FEB.2024 09:57:16

Low Frequency: 450.00625MHz



Date: 17.FEB.2024 09:57:48

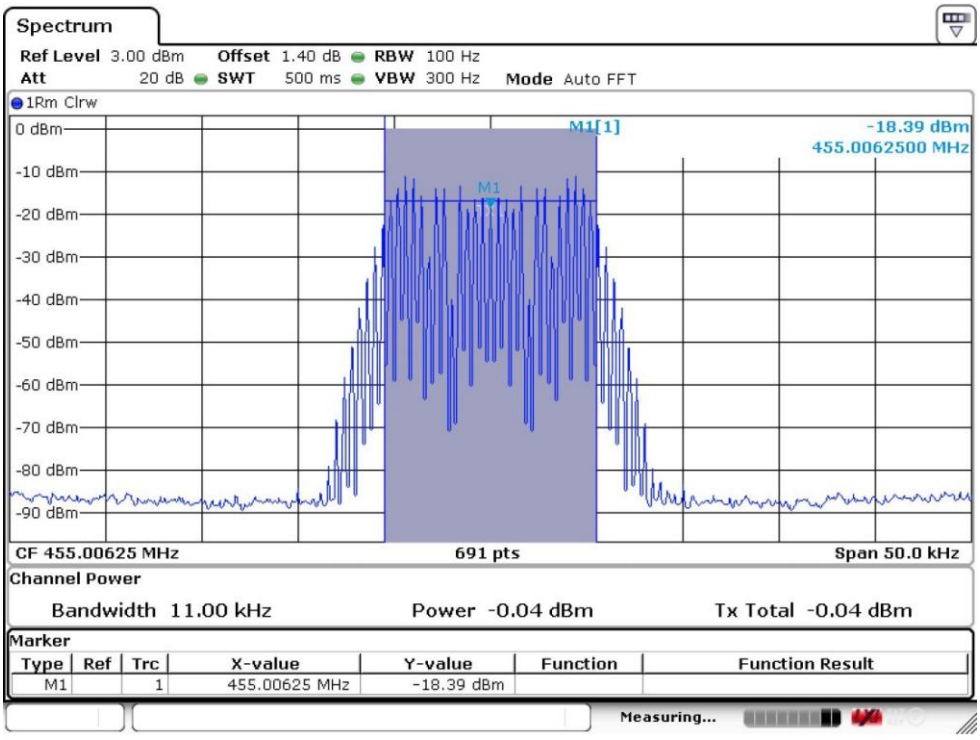
Middle Frequency: 479.0MHz



Date: 17.FEB.2024 09:58:24

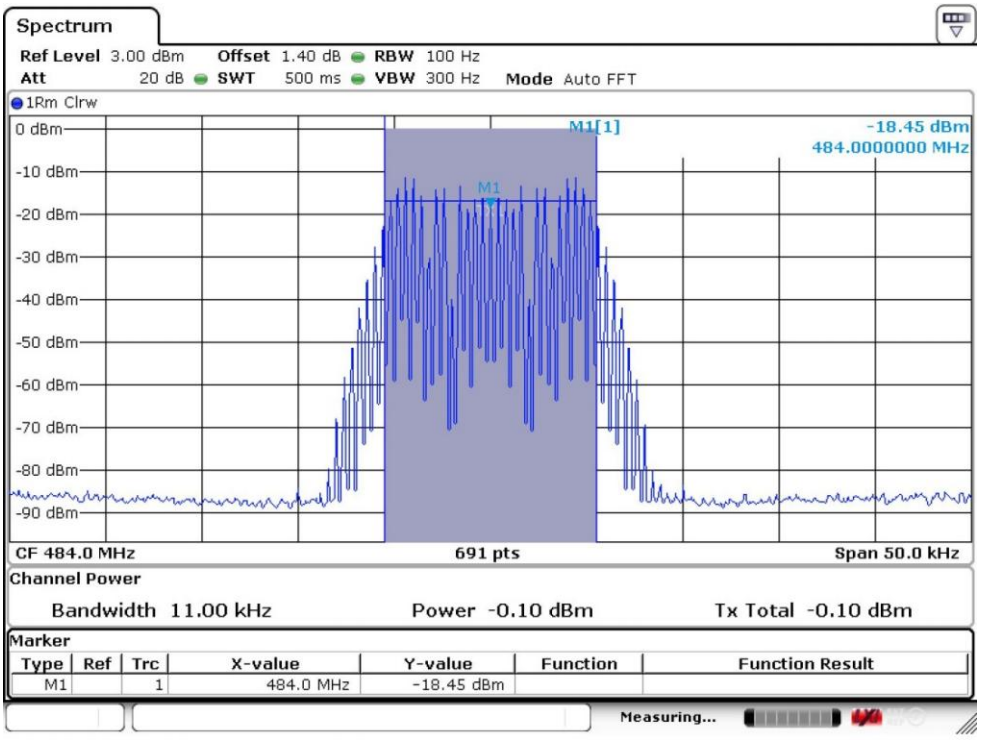
High Frequency: 508.99375MHz

10.2.3.4.2. Uplink



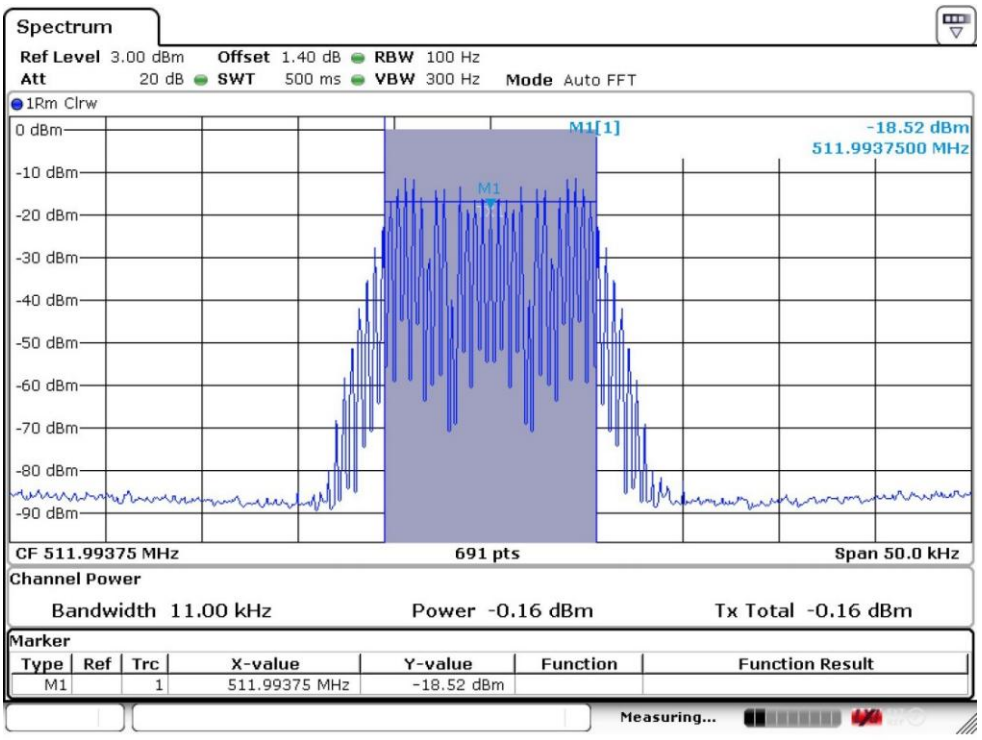
Date: 17.FEB.2024 09:58:50

Low Frequency: 455.00625MHz



Date: 17.FEB.2024 09:59:17

Middle Frequency: 484.0MHz

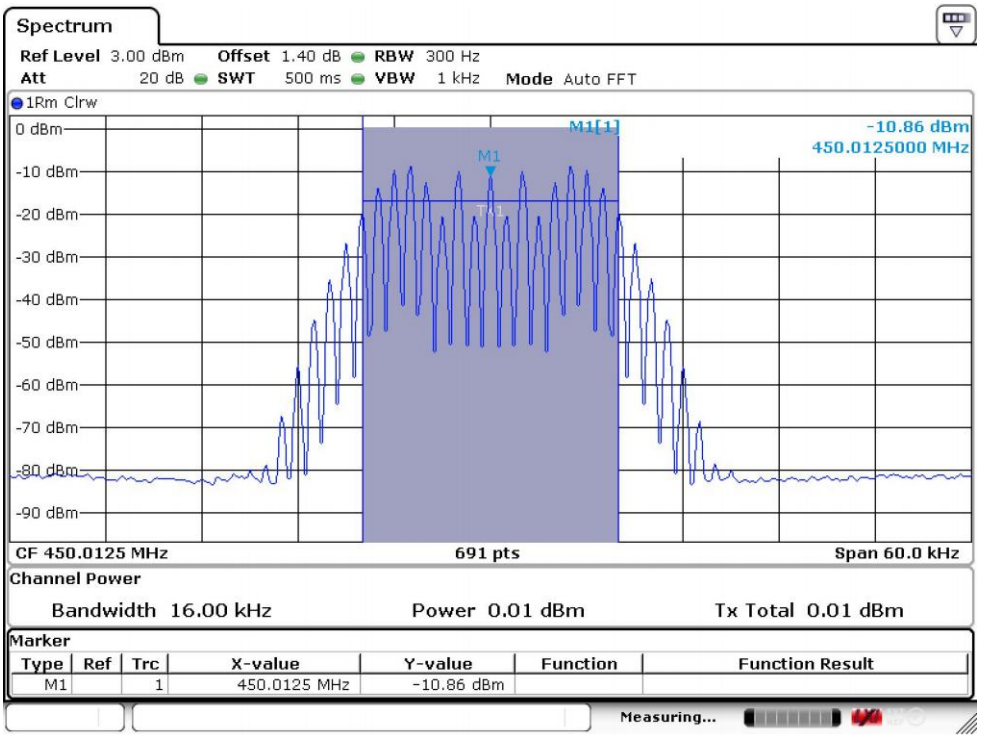


Date: 17.FEB.2024 09:59:45

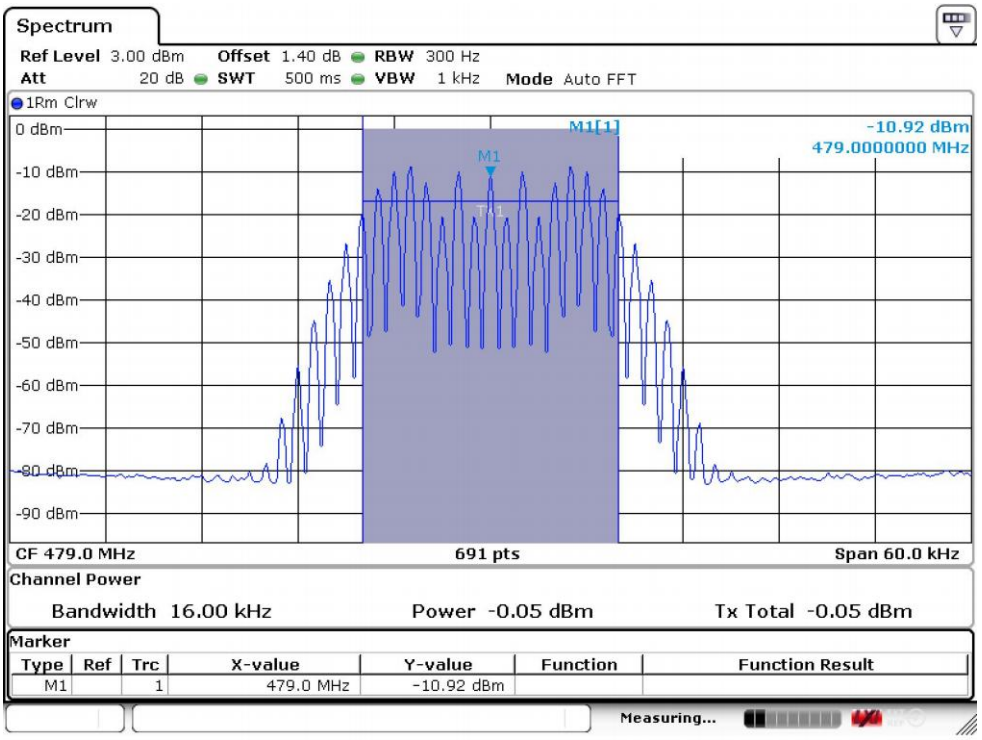
High Frequency: 511.99375MHz

10.2.3.5. Analog FM (25kHz)

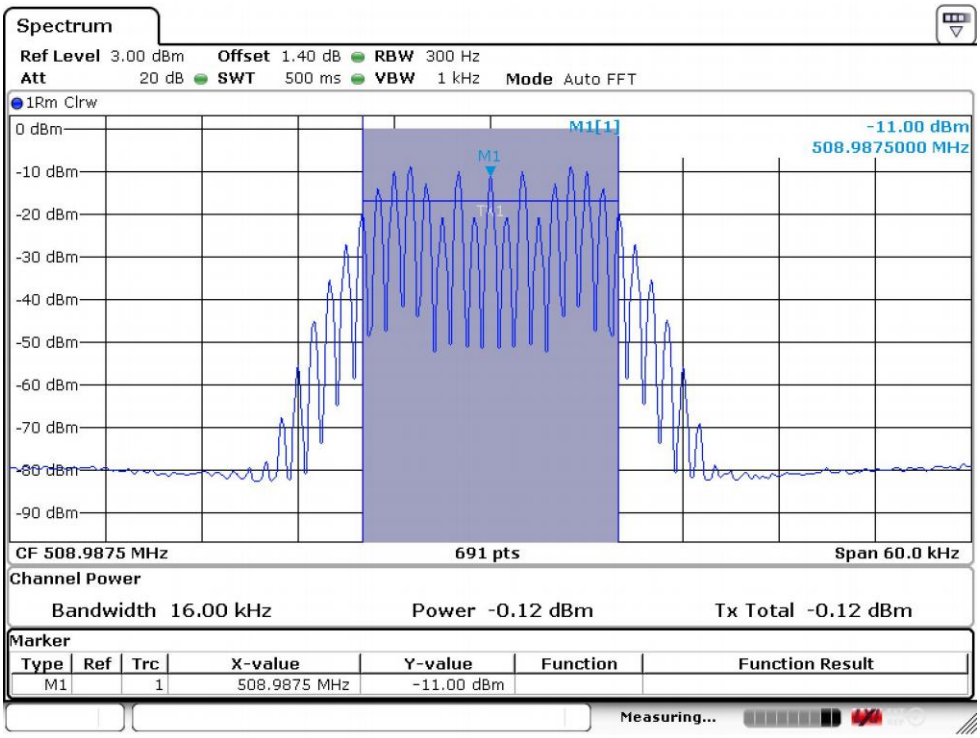
10.2.3.5.1. Downlink



Low Frequency: 450.0125MHz

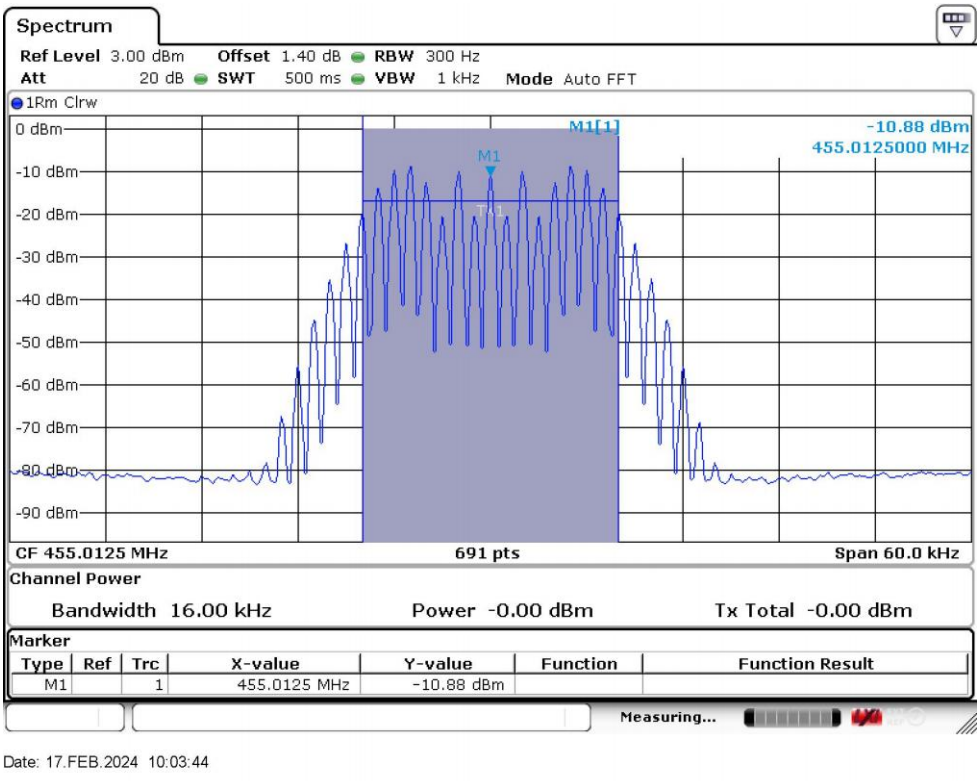


Middle Frequency: 479.0MHz

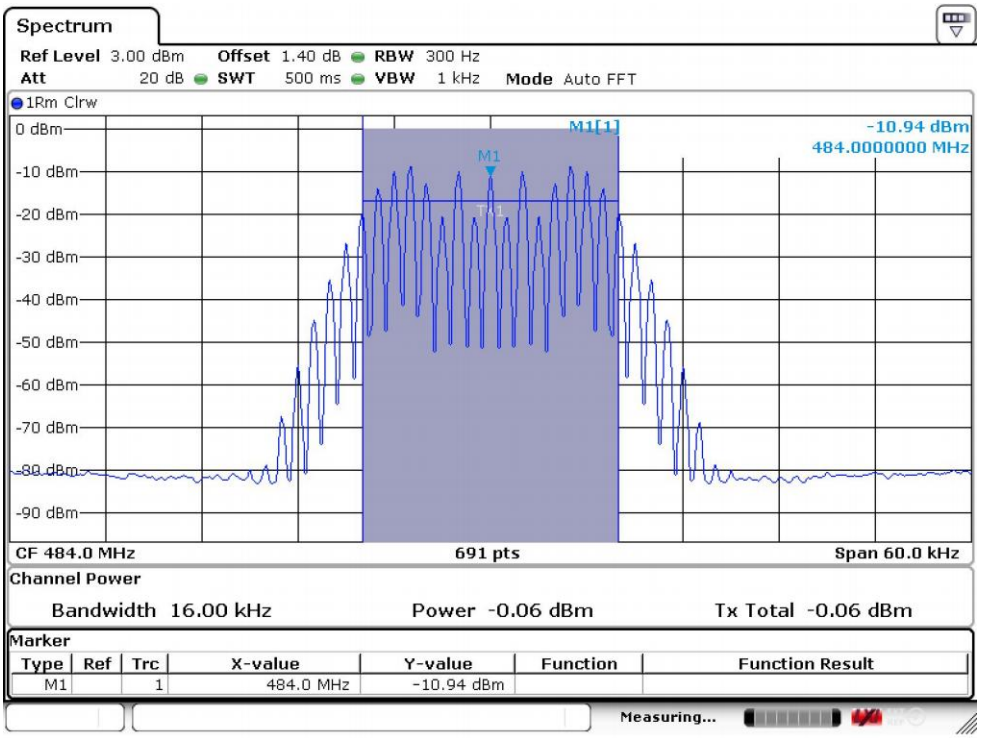


High Frequency: 508.9875MHz

10.2.3.5.2. Uplink

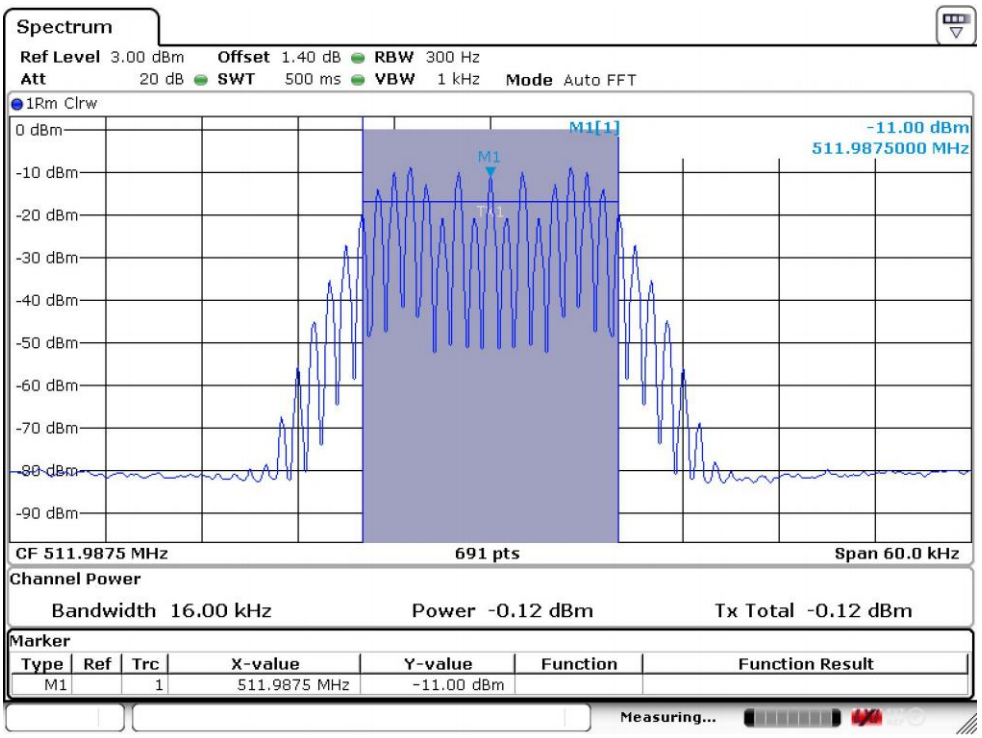


Low Frequency: 455.0125MHz



Date: 17.FEB.2024 10:04:03

Middle Frequency: 484.0MHz



Date: 17.FEB.2024 10:04:25

High Frequency: 511.9875MHz

10.3. AGC Threshold

Requirements:	KDB 935210 D05 clause 4.2
Test Method:	KDB 935210 D05 clause 3.2

10.3.1. Requirements

Testing at and above the AGC threshold will be required.[6] The AGC threshold shall be determined by applying the procedure of 3.2, but with the signal generator configured to produce a test signal defined in Table 1, a CW input signal, or a digitally modulated signal, consistent with the discussion about signal types in 4.1.

10.3.2. Test configuration

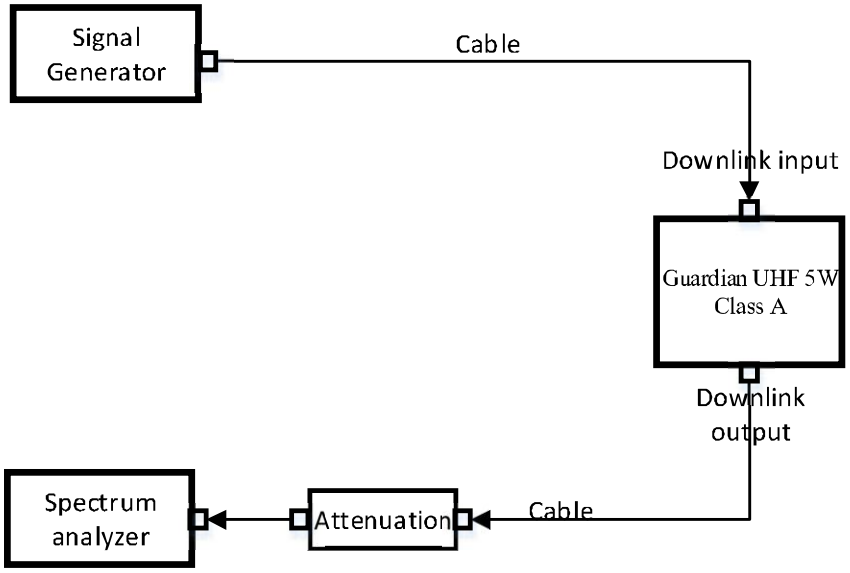


Figure 10.3-1 Downlink connection diagram

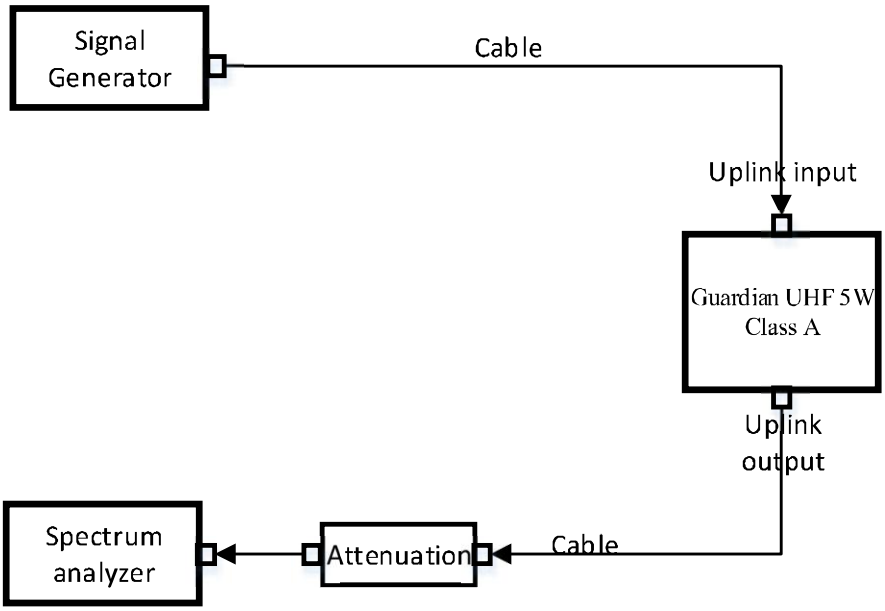


Figure 10.3-2 Uplink connection diagram

10.3.3. Test procedures

3.2 Measuring AGC threshold level

The AGC threshold is to be determined as follows.[3]

In the case of fiber-optic distribution systems, the RF input port of the equipment under test (EUT) refers to the RF input of the supporting equipment RF to optical convertor; see also descriptions and diagrams for typical DAS booster systems in KDB Publication 935210 D02 [R7].

Devices intended to be directly connected to an RF source (donor port) only need to be evaluated for any over-the-air transmit paths.

a) Connect a signal generator to the input of the EUT.
b) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
c) The signal generator should initially be configured to produce either of the required test signals (i.e., broadband or narrowband).
d) Set the signal generator frequency to the center frequency of the EUT operating band.
e) While monitoring the output power of the EUT, measured using the methods of 3.5.3 or 3.5.4, increase the input level until a 1 dB increase in the input signal power no longer causes a 1 dB increase in the output signal power.
f) Record this level as the AGC threshold level.
g) Repeat the procedure with the remaining test signal.

——— The following blanks ———

10.3.4. Test results

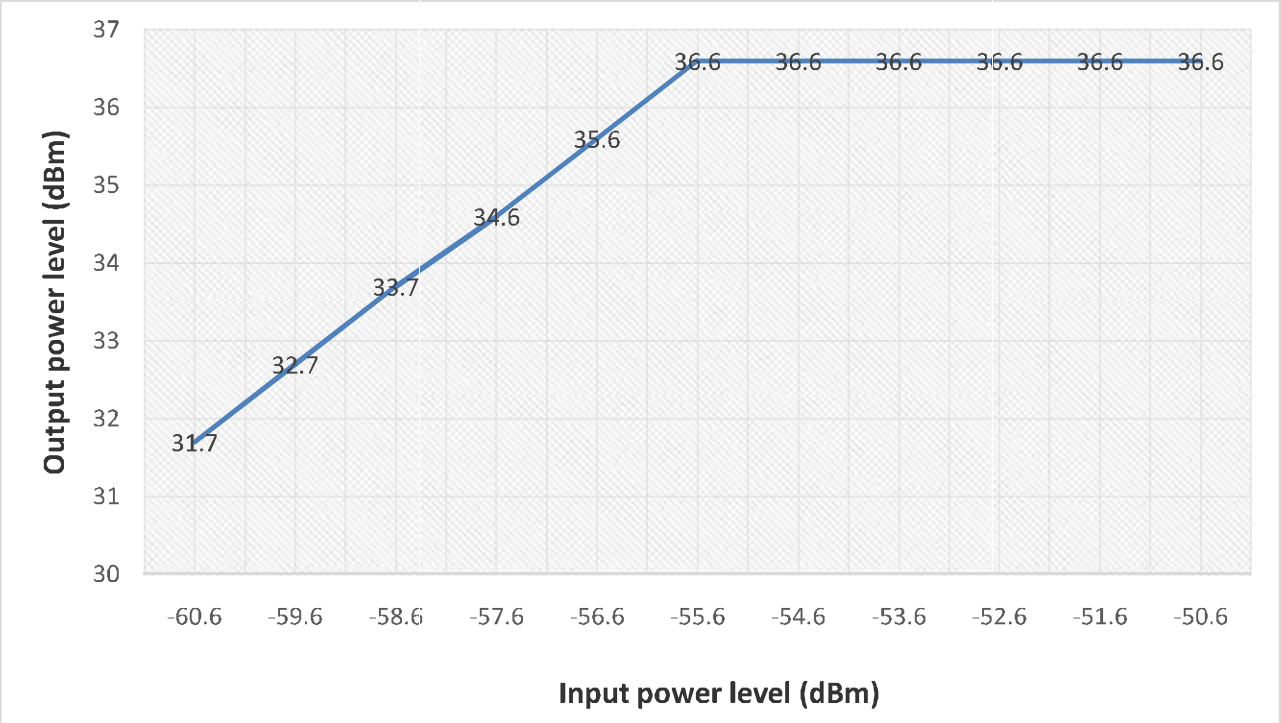
Test Date (yy-mm-dd): 2024-02-17

Normal condition: Temp: 25.9℃, Humid: 54%, Atmospheric Pressure:101kpa

Supply Voltage: DC +24V

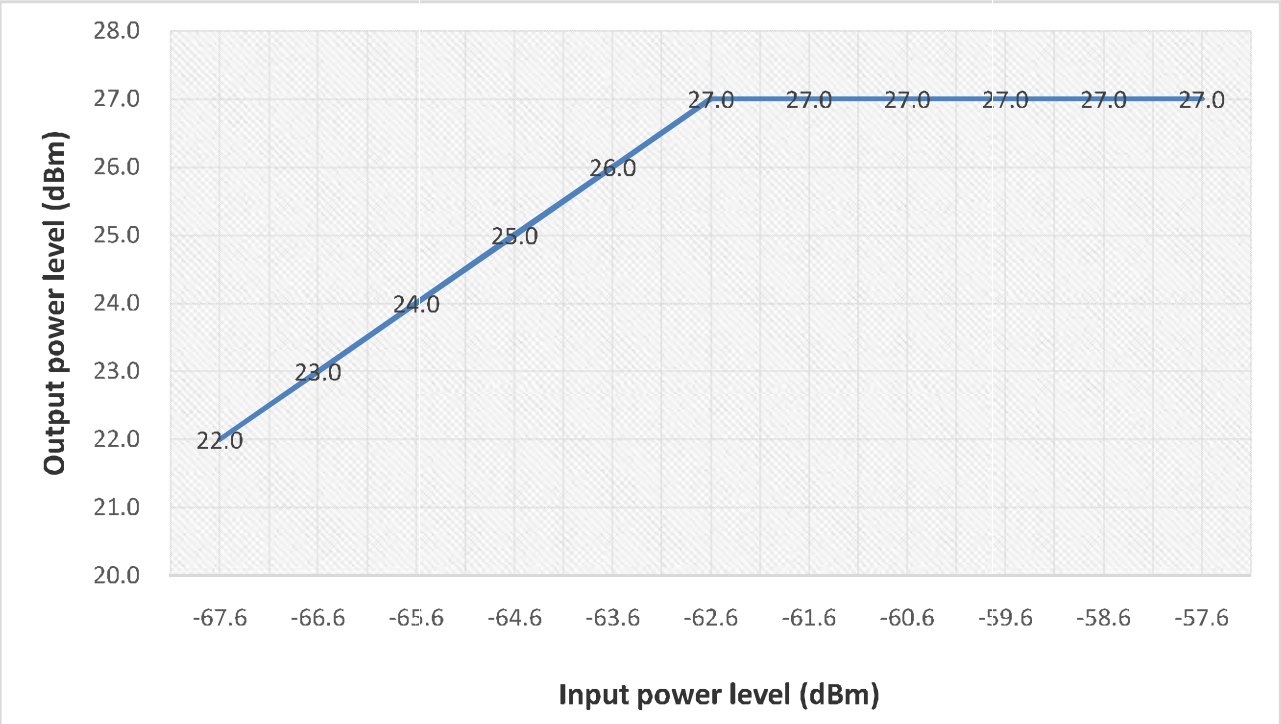
10.3.4.1. Downlink

Test frequency	EUT Input power (dBm)	EUT Input cable loss (dB)	EUT Corrected Input power (dBm)	EUT Corrected Output power (dBm)
Downlink 479.0MHz	-60.1	0.5	-60.6	31.7
	-59.1	0.5	-59.6	32.7
	-58.1	0.5	-58.6	33.7
	-57.1	0.5	-57.6	34.6
	-56.1	0.5	-56.6	35.6
	-55.1	0.5	-55.6	36.6
	-54.1	0.5	-54.6	36.6
	-53.1	0.5	-53.6	36.6
	-52.1	0.5	-52.6	36.6
	-51.1	0.5	-51.6	36.6
	-50.1	0.5	-50.6	36.6



10.3.4.2. Uplink

Test frequency	EUT Input power (dBm)	EUT Input cable loss (dB)	EUT Corrected Input power (dBm)	EUT Corrected Output power (dBm)
Downlink 484.0MHz	-67.1	0.5	-67.6	22.0
	-66.1	0.5	-66.6	23.0
	-65.1	0.5	-65.6	24.0
	-64.1	0.5	-64.6	25.0
	-63.1	0.5	-63.6	26.0
	-62.1	0.5	-62.6	27.0
	-61.1	0.5	-61.6	27.0
	-60.1	0.5	-60.6	27.0
	-59.1	0.5	-59.6	27.0
	-58.1	0.5	-58.6	27.0
	-57.1	0.5	-57.6	27.0



10.4. Out-of-band rejection

Test requirement:	KDB 935210 D05 clause 4.3 FCC PART 90.219 (a) FCC PART 90.219 (d)((7)
Test Method:	KDB 935210 D05 clause 4.3

10.4.1. Requirements

According to KDB 935210 D05 clause 4.3 requirement, a signal booster shall reject amplification of other signals outside of its passband. Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

10.4.2. Test configuration

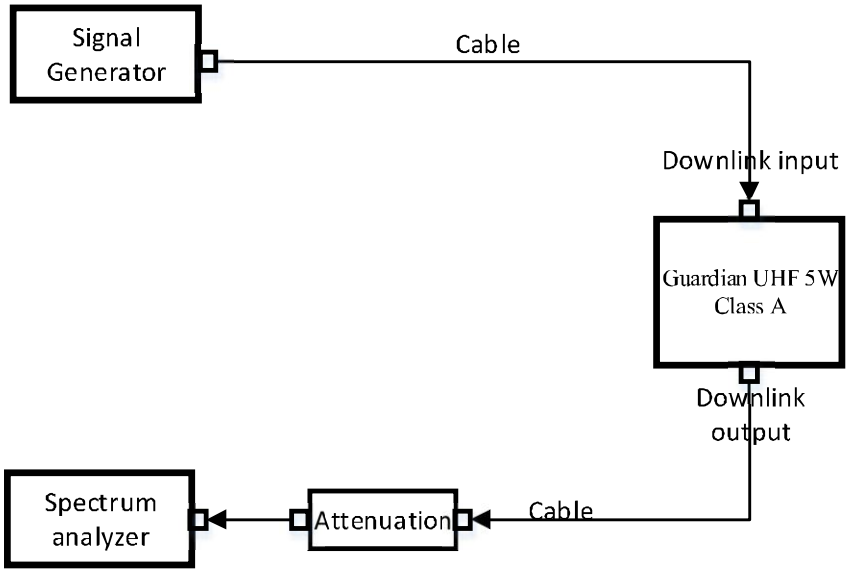


Figure 10.4-1 Downlink connection diagram

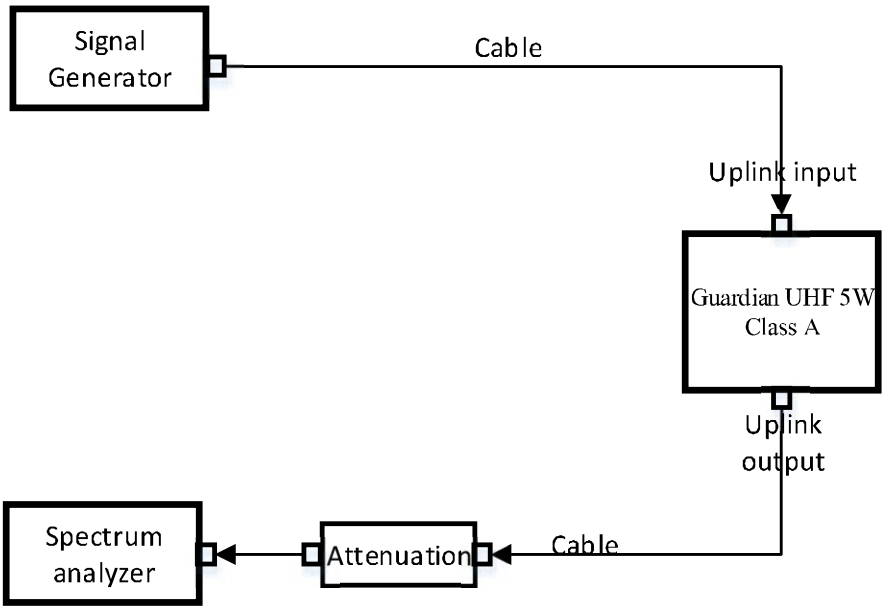


Figure 10.4-2 Uplink connection diagram

10.4.3. Test procedures

a) Connect a signal generator to the input of the EUT.
b) Configure a swept CW signal with the following parameters:
   1) Frequency range = ± 250 % of the manufacturer's specified pass band.
   2) The CW amplitude shall be 3 dB below the AGC threshold (see 4.2), and shall not activate the AGC threshold throughout the test.
   3) Dwell time = approximately 10 ms.
   4) Frequency step = 50 kHz.
c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
d) Set the RBW of the spectrum analyzer to between 1 % and 5 % of the manufacturer's rated passband, and VBW = 3 × RBW.
e) Set the detector to Peak and the trace to Max-Hold.
f) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f_0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).
g) Capture the frequency response plot for inclusion in the test report.

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10.4.4. Test results

Test Date (yy-mm-dd): 2024-02-02

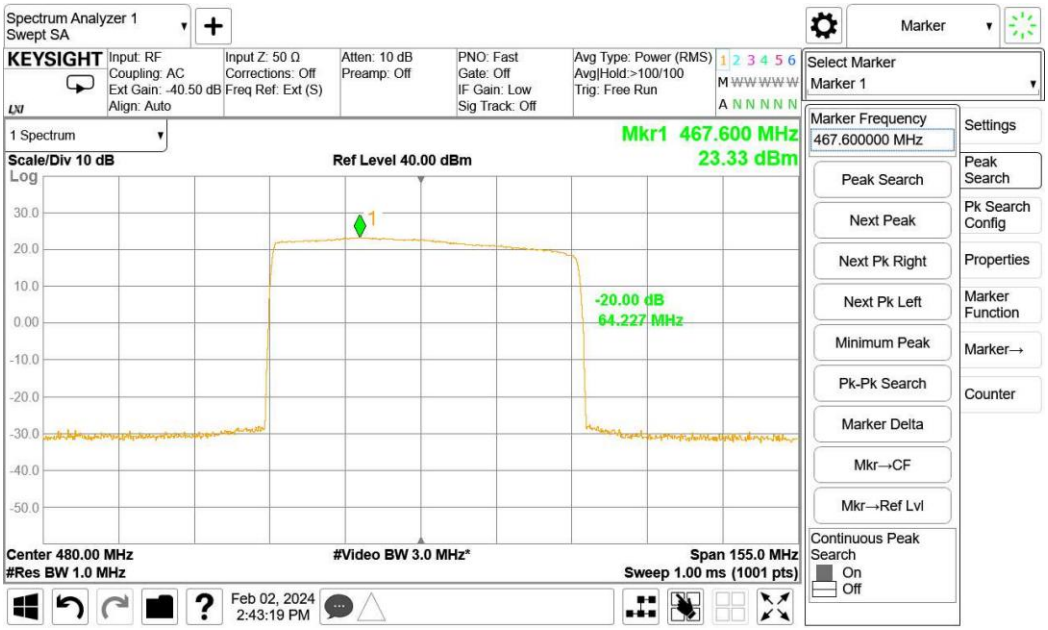
Normal condition: Temp: 22.8°C, Humid: 36%, Atmospheric Pressure:101kpa

Supply Voltage: DC +24V

RBW (kHz)	VBW (kHz)	Peak frequency (MHz)	Peak power (dBm)	20dB BW (MHz)
(1) Downlink				
1000	3000	475.195	33.17	64.17
(2) Uplink				
1000	3000	467.60	23.33	63.23

10.4.5. Test screenshot

Downlink:



Uplink

——— The following blanks ———

10.5. Input VS output Comparison

Test requirement:	KDB 935210 D05 clause 4.4 FCC PART 2.1049(c) FCC PART 90.219 (c)(4)(ii) FCC PART 90.219 (e)(4)(iii)
Test Method:	KDB 935210 D05 clause 4.4

10.5.1. Requirements

10.5.1.1. Emission mask

According to KDB 935210 D05 clause 4.4 requirement:

4.4 Input-versus-output signal comparison

Compliance with the emission mask of the EUT output shall be measured for the public safety service signal types as specified in 4.1.

According to the characteristics of the product and FCC PART 90.210 requirement, clause (b), clause (c), clause (d) and clause (e) in FCC PART 90.210 are used, except as indicated else where in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for device operating under this part.

§90.210 Emission masks.

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

APPLICABLE EMISSION MASKS

Frequency band (MHz)	Mask for equipment with audio low pass filter	Mask for equipment without audio low pass filter
Below 25[1]	A or B	A or C
25-50	B	C
72-76	B	C
150-174[2]	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-512[2 5]	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854[6]	B	H
809-824/854-869[35]	B, D	D, G.
896-901/935-940	I	J
902-928	K	K
929-930	B	G
4940-4990 MHz	L or M	L or M
5850-5925[4]		
All other bands	B	C

NOTE: Emission Mask B and Mask C –25 kHz channel;
Emission Mask D—12.5 kHz channel;
Emission Mask E—6.25kHz;

10.5.1.1.1. Emission Mask B

(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

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10.5.1.1.2. Emission Mask C

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (f_d/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (f_d^2/11) dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

10.5.1.1.3. Emission Mask D

(d) *Emission Mask D—12.5 kHz channel bandwidth equipment.* For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27(f_d−2.88 kHz) dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

10.5.1.1.4. Emission Mask E

(e) *Emission Mask E—6.25 kHz or less channel bandwidth equipment.* For transmitters designed to operate with a 6.25 kHz or less bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(f_d−3 kHz) or 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least 55 + 10 log (P) or 65 dB, whichever is the lesser attenuation.

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide (usually two or three times the channel bandwidth) to capture the true peak emission of the equipment under test. In order to show compliance with the emission mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must not be less than the instrument resolution bandwidth. For emissions beyond 50 kHz from the edge of the authorized bandwidth, see paragraph (o) of this section. If it can be shown that use of the above instrumentation settings do not accurately represent the true interference potential of the equipment under test, an alternate procedure may be used provided prior Commission approval is obtained.

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