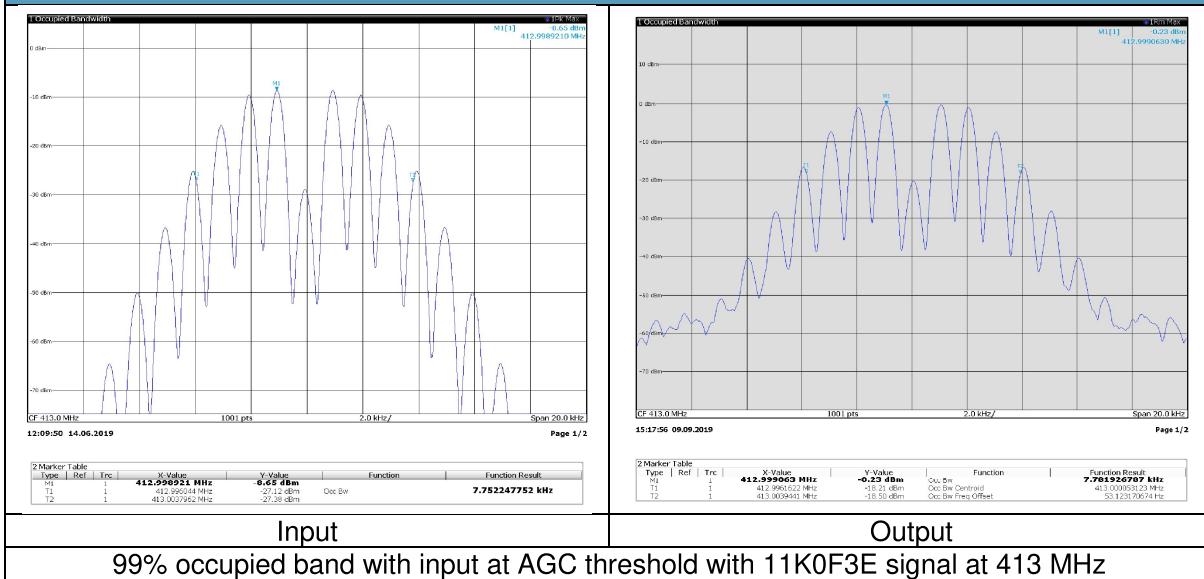
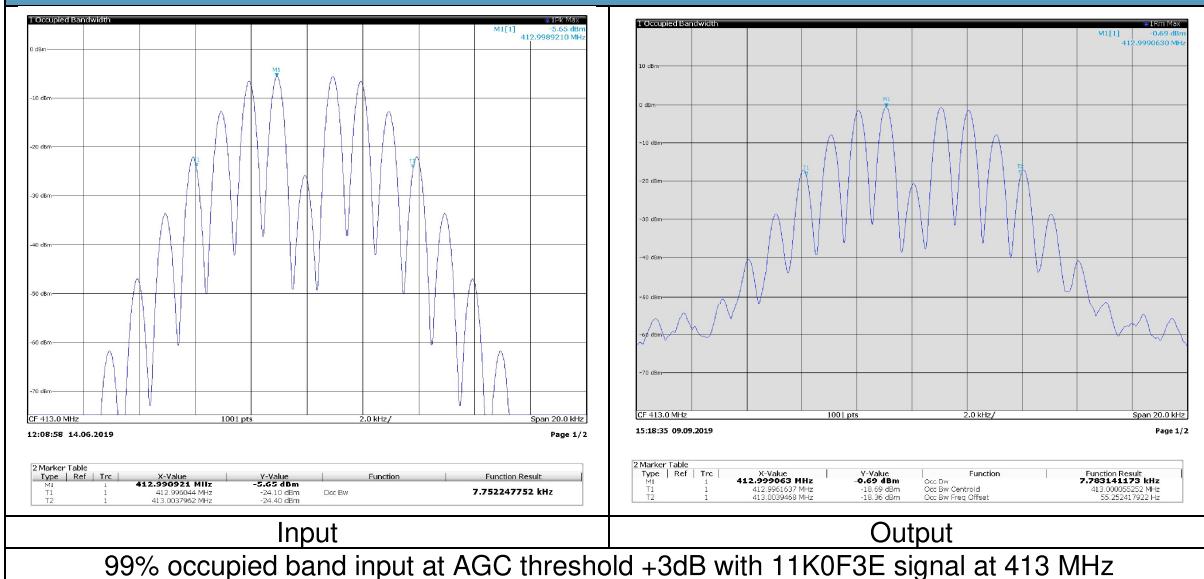


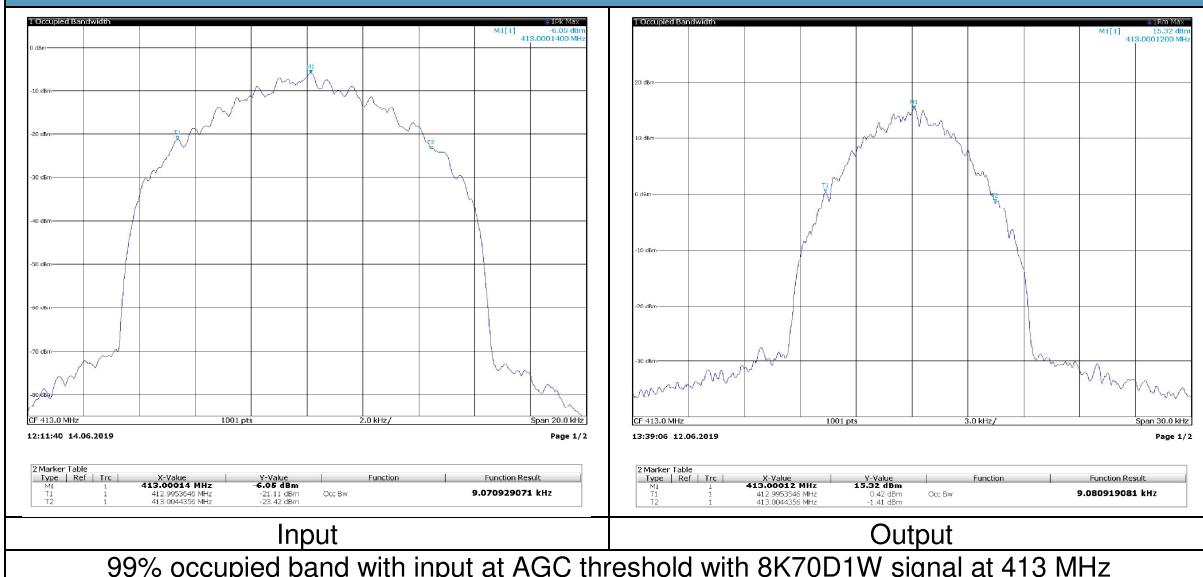
Test data



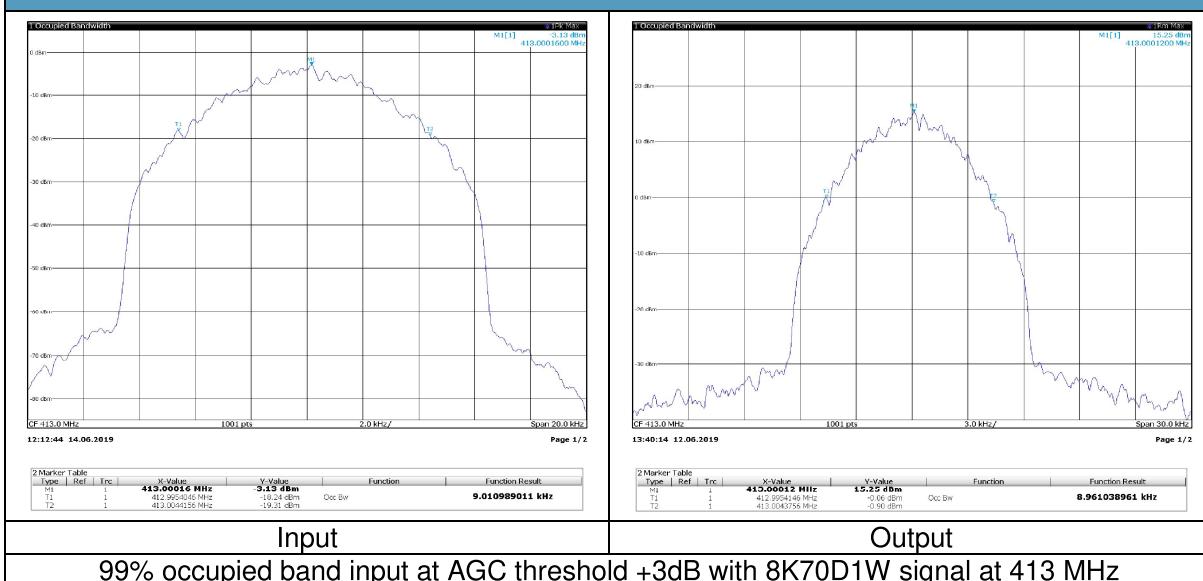
Test data



Test data



Test data





6.4 Input/output power and amplifier/booster gain

FCC 90.205(r)

All other frequency bands. Requested transmitter power will be considered and authorized on a case by case basis.

FCC 90.219(e)(1)

The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

RSS-131 clause 6.2

The output power of the zone enhancer shall comply with the transmitter output power of the equipment with which it is to be used (as specified in RSS-119) and shall be within ± 1.0 dB of the zone enhancer manufacturer's rated output power

RSS-119 clause 5.4

The output power shall be within ± 1 dB of the manufacturer's rated power listed in the equipment specifications. The transmitter output power limits set forth in Table 2 will come into force upon the publication of Issue 12 of this standard and will apply to newly certified equipment.

Table 2 —Transmitter Output Power

Frequency Bands (MHz)	Transmitter Output Power (W)	
	Base/Fixed Equipment	Mobile Equipment
27.41-28 and 29.7-50	300	30
72-76	No limit	1
138-174	110	60
217-218 and 219-220	110	30 <small>±</small>
220-222	See SRSP-512 for ERP limit	50
406.1-430 and 450-470	110	60
768-776 and 798-806	See SRSP-511 for ERP limit	30 3 W ERP for portable equipment
806-821/851-866 and 821-824/866-869	110	30
896-901/935-940	110	60
929-930/931-932	110	30
928-929/952-953 and 932-932.5/941-941.5	110	30
932.5-935/941.5-944	110	30

Test date: 2019-06-13

Test results: Pass

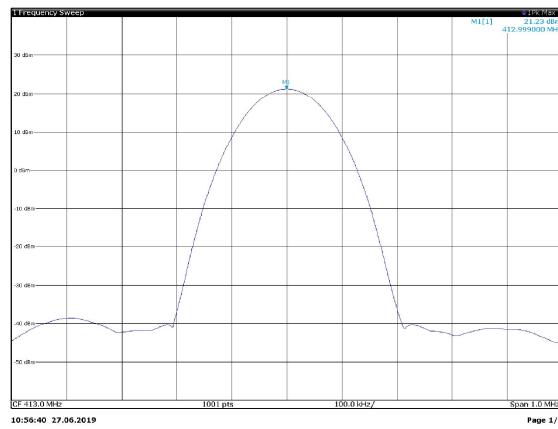
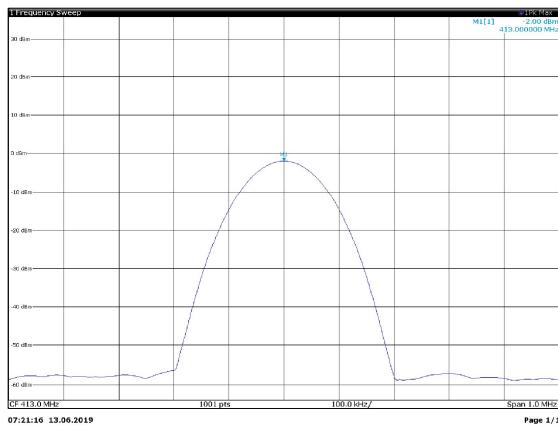
Special notes

Modulation used: CW and 8K70D1W

Test data

Gmax antenna gain (dBi) = 39.14 – 22.37= 16.77 dBi

Test data



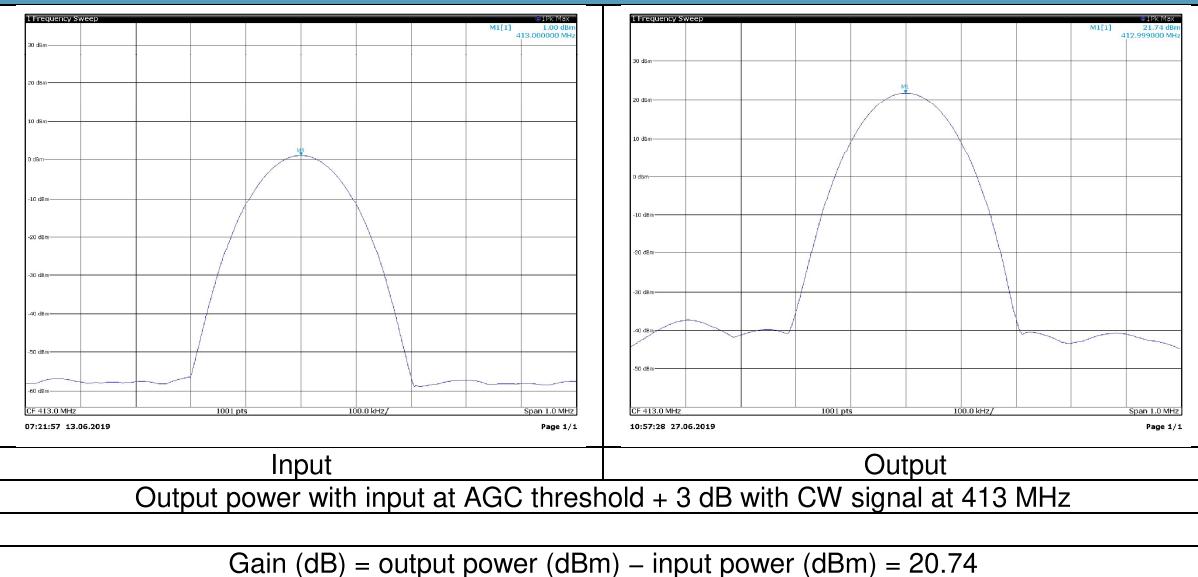
Input

Output

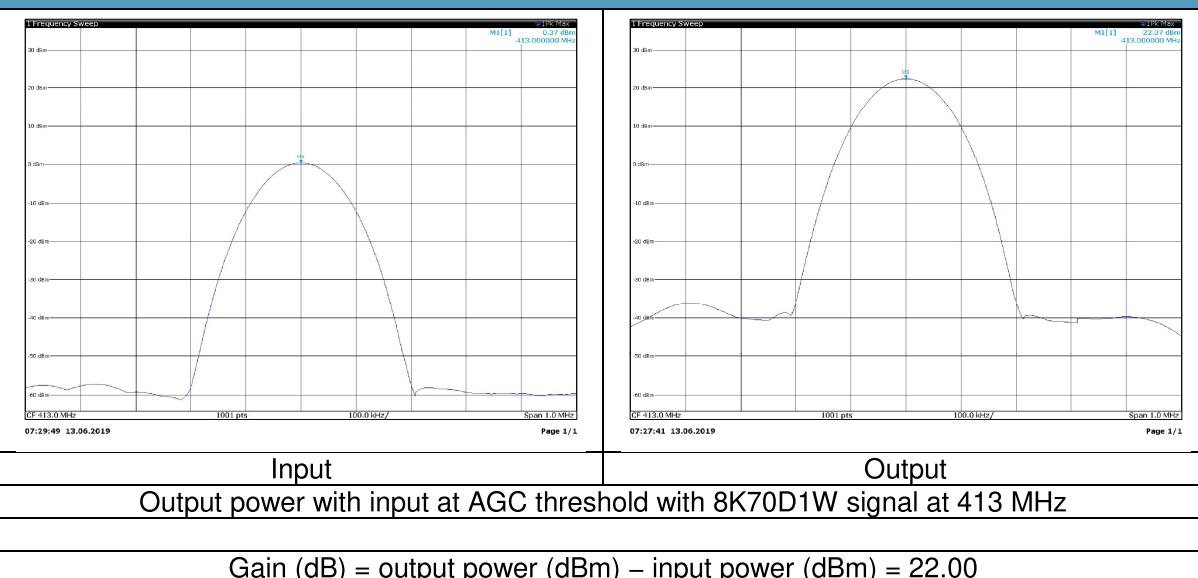
Output power with input at AGC threshold with CW signal at 413 MHz

Gain (dB) = output power (dBm) – input power (dBm) = 23.26

Test data



Test data



Test data




6.5 Noise figure measurements

FCC 90.219(e)(2)

The noise figure of a signal booster must not exceed 9 dB in either direction. As stated in the KDB 935210 D02 Signal Boosters Certification v04r02, for the remote unit of a conventional fiber-connected host/remote DAS booster system, it is acceptable to submit compliance information and test data consistent with Section 90.219(d)(6)(ii) (i.e., ERP of noise ≤ -43 dBm in 10 kHz RBW) for the downlink path only, in place of Section 90.219(e)(2) noise figure test data (i.e., NF ≤ 9 dB for both UL and DL). Test reports must provide explicit details about the instrumentation and test procedure used for Section 90.219(d)(6)(ii) testing.

RSS-131 clause 6.4

The ERP of noise within the passband should not exceed -43 dBm in a 10 kHz measurement bandwidth. The ERP of noise in spectrum more than 1 MHz outside of the passband should not exceed -70 dBm in a 10 kHz measurement bandwidth. The noise figure of a zone enhancer shall not exceed 9 dB in either direction.

Test date: 2019-06-13

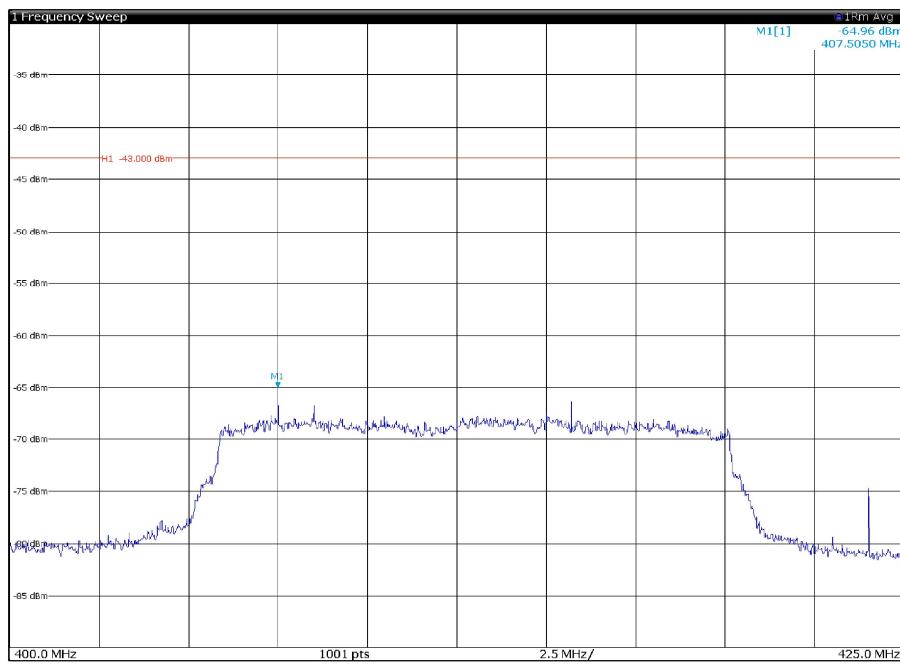
Test results: Pass

Special notes

Spectrum analyzer settings:

Resolution bandwidth	10 kHz
Video bandwidth	$\geq 3 \times$ RBW
Frequency span	25 MHz
Detector mode	Rms
Trace mode	Max Hold

Test data



14:08:31 13.06.2019

Page 1/1

6.6 Out-of-band/out-of-block emissions conducted measurements

FCC 90.210(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:

- (4) 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.
- (5) 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.
- (6) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

FCC 90.210(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:

- (5) 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;
- (6) 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 $29 \log (f_d/11)$ dB or 50 dB, whichever is the lesser attenuation;
- (7) 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.
- (8) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:
 - (iii) For stations of point-to-point systems in the fixed service: -45 dBW/27 MHz.
 - (iv) For stations in the mobile service: -60 dBW/27 MHz.

FCC 90.210(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 $7.27(f_d-2.88 \text{ kHz})$ 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.

FCC 90.219(e)(3)

Spurious emissions from a signal booster must not exceed -13 dBm within any 100 kHz measurement bandwidth.

RSS-131 clause 6.5

The spurious emissions of a zone enhancer shall not exceed -13 dBm in any 100 kHz measurement bandwidth.

RSS-119 clause 5.8.3

Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter. The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table 7.

Table 7 — Emission Mask D

Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(p)$	Specified in Section 4.2.2

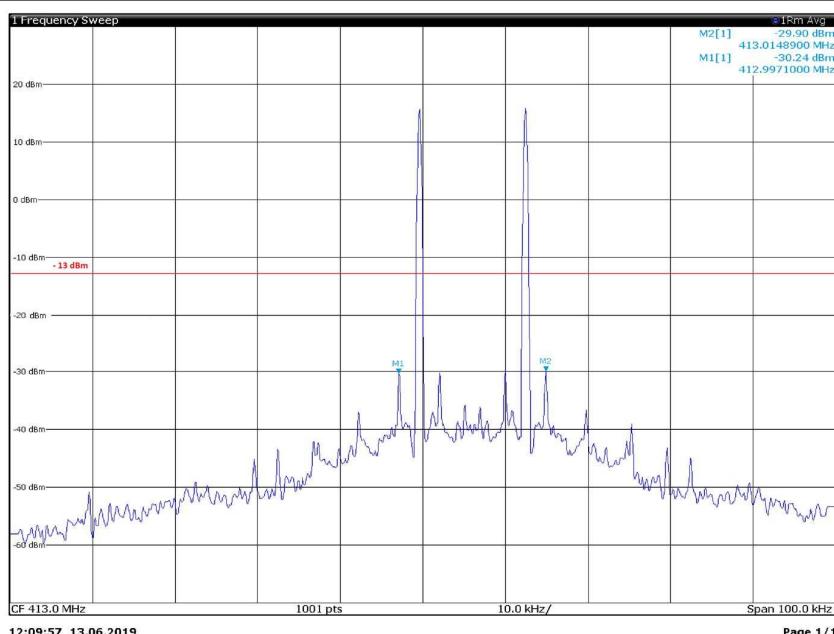
Test date: 2019-06-13

Test results: Pass

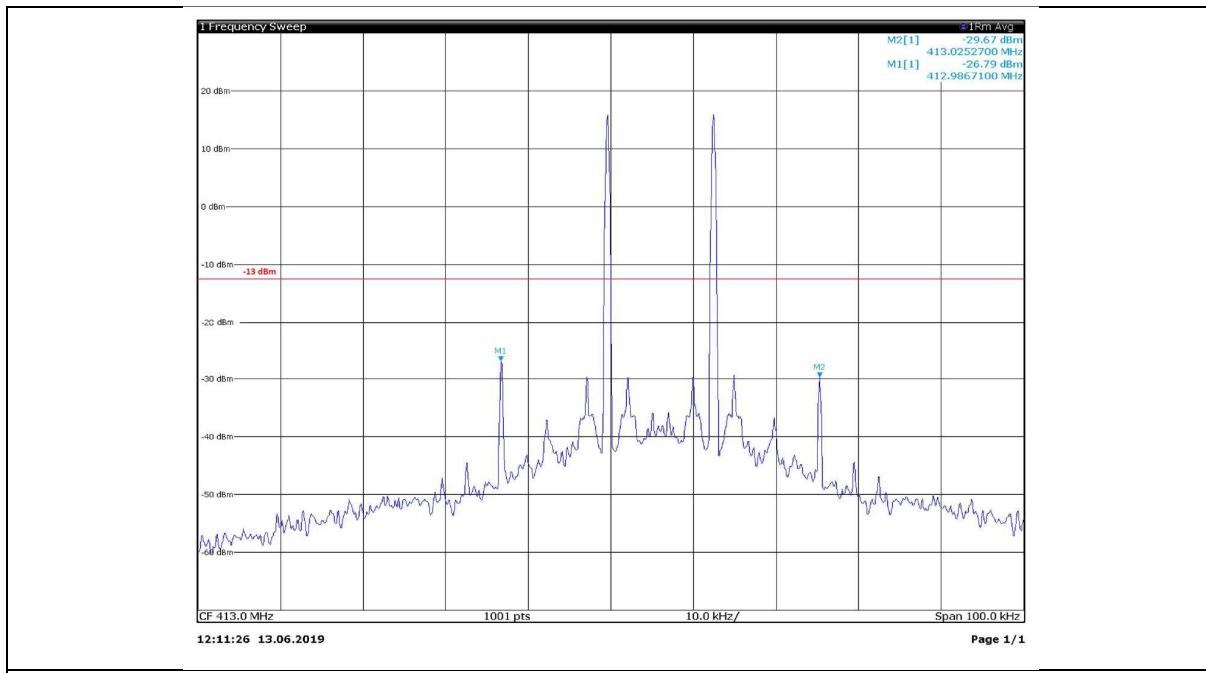
Special notes

Modulation used: CW and 8K70D1W

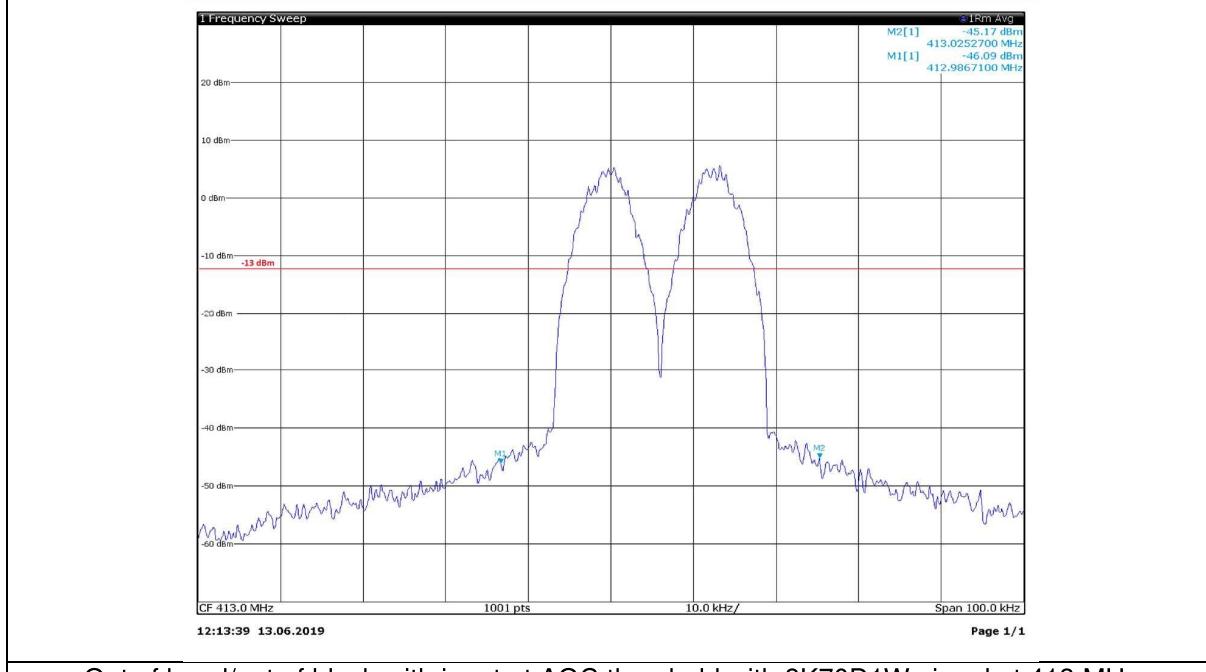
Test data



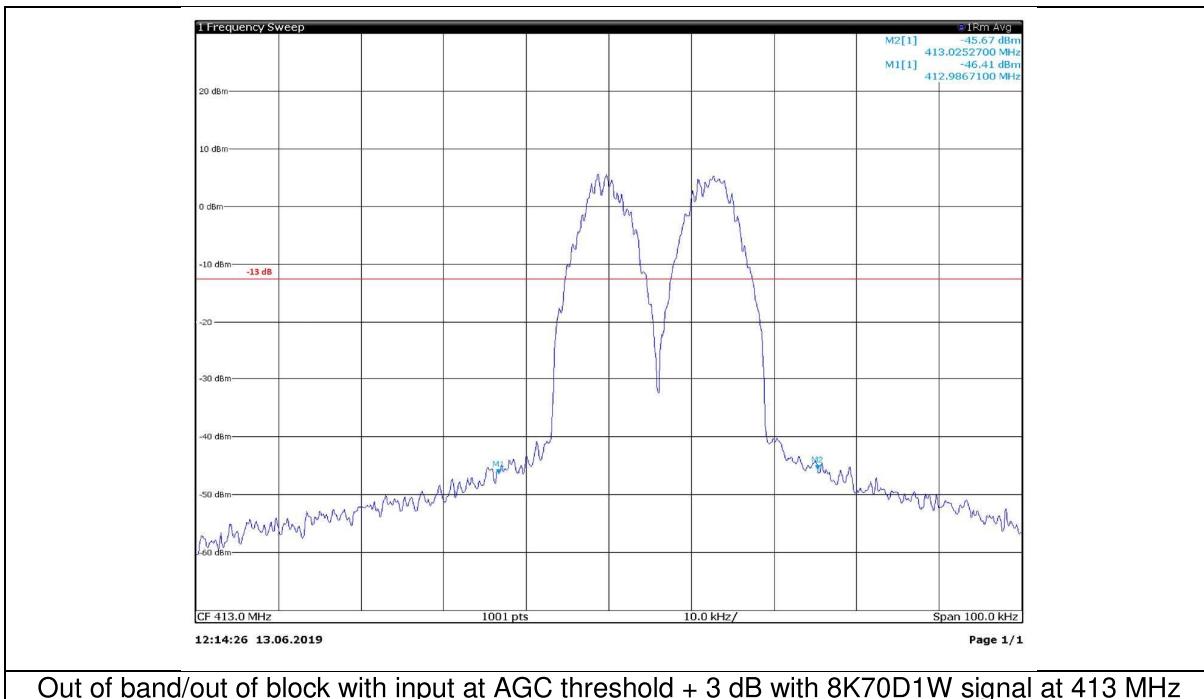
Out of band/out of block with input at AGC threshold with CW signal at 413 MHz



Out of band/out of block with input at AGC threshold + 3 dB with CW signal at 413 MHz



Out of band/out of block with input at AGC threshold with 8K70D1W signal at 413 MHz



6.7 EUT spurious emissions conducted measurements

FCC 90.210(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:

- (7) 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.
- (8) 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.
- (9) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

FCC 90.210(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:

- (9) 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;
- (10) 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 $29 \log (f_d/11)$ dB or 50 dB, whichever is the lesser attenuation;
- (11) 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.
- (12) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:
 - (v) For stations of point-to-point systems in the fixed service: -45 dBW/27 MHz.
 - (vi) For stations in the mobile service: -60 dBW/27 MHz.

FCC 90.210(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 $7.27(f_d-2.88 \text{ kHz})$ 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.

RSS-131 clause 6.6(2)

The retransmitted signals shall meet the unwanted emission limits in the RSS that applies to the equipment with which the zone enhancer is to be used.

RSS-119 clause 5.8.3

Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter. The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table 7.

Table 7 — Emission Mask D

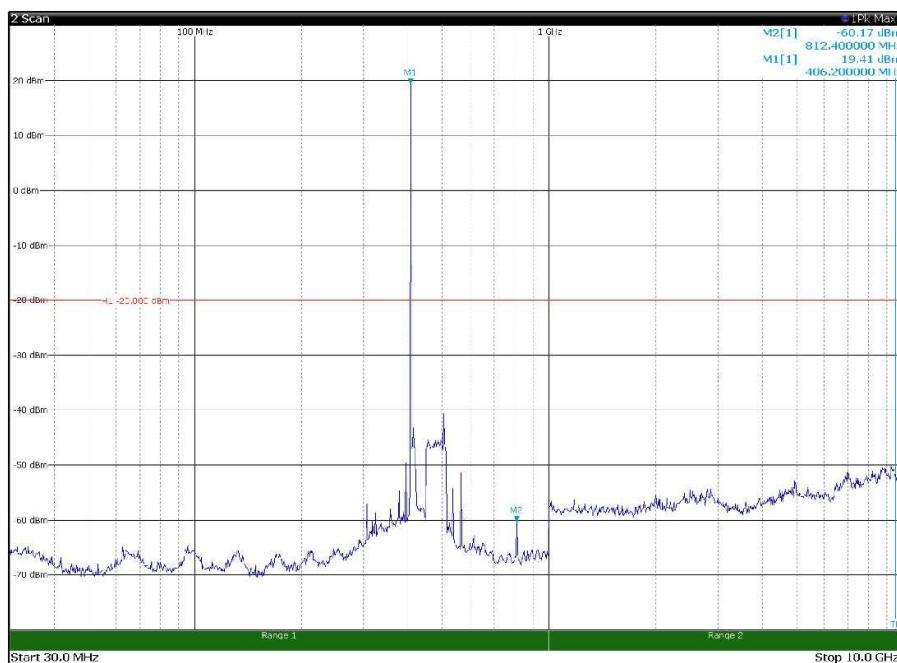
Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(p)$	Specified in Section 4.2.2

Test date: 2019-06-14

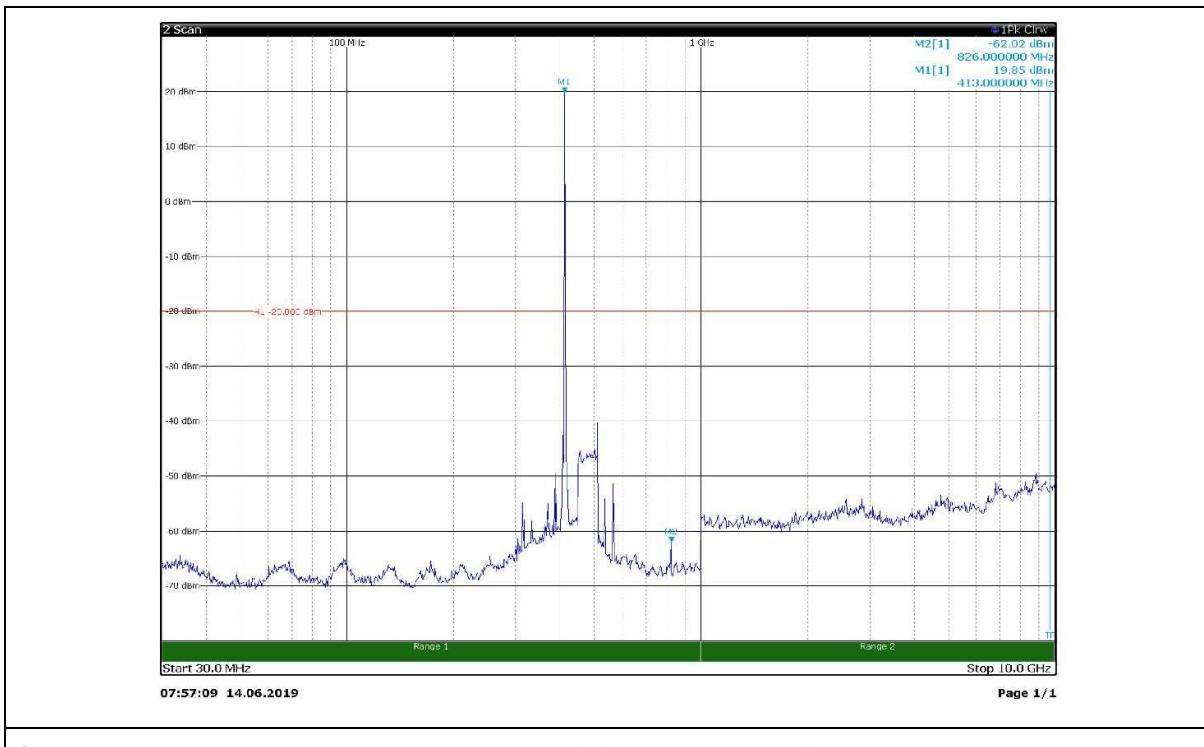
Test results: Pass

Special notes

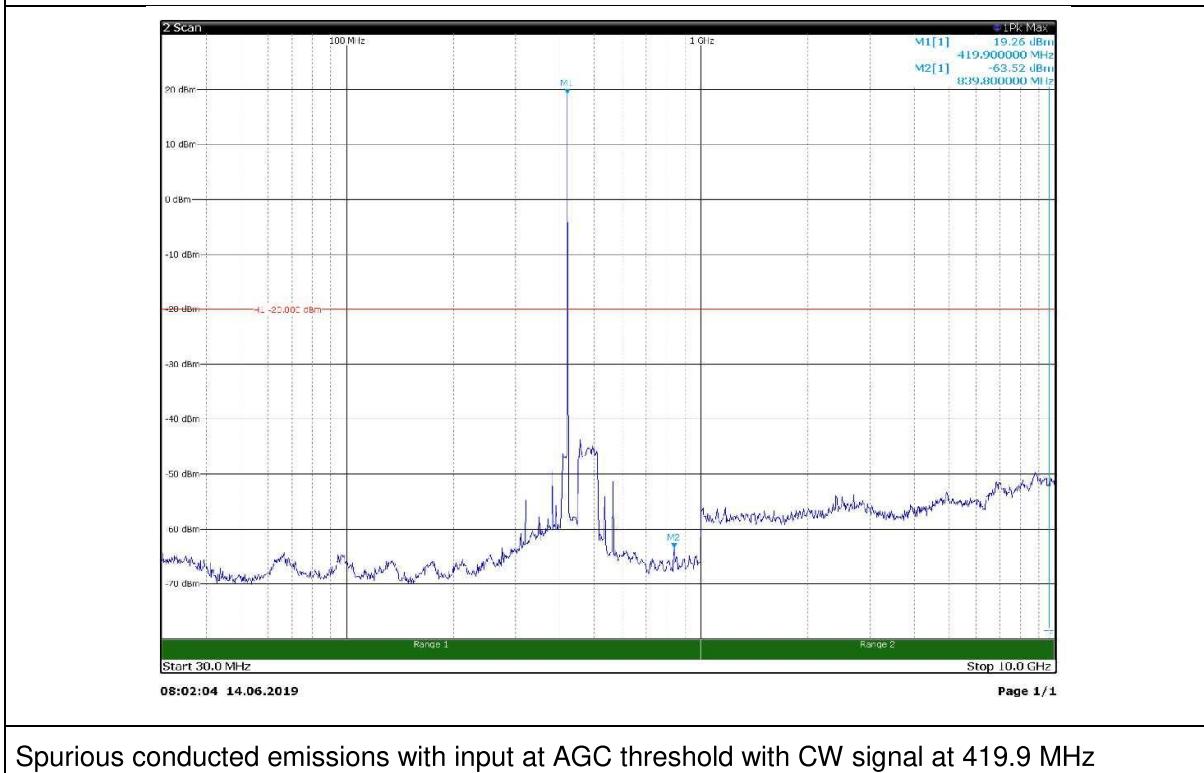
Modulation used: CW and 8K70D1W.

Test data


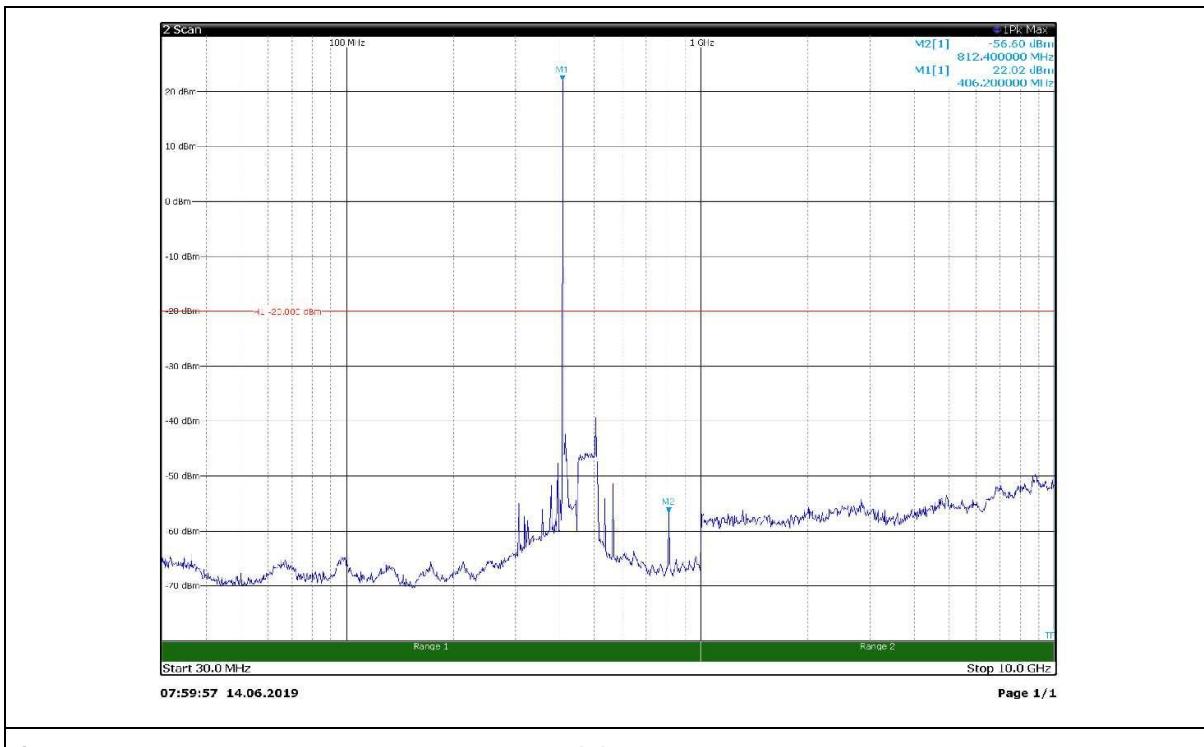
Spurious conducted emissions with input at AGC threshold with CW signal at 406.2 MHz



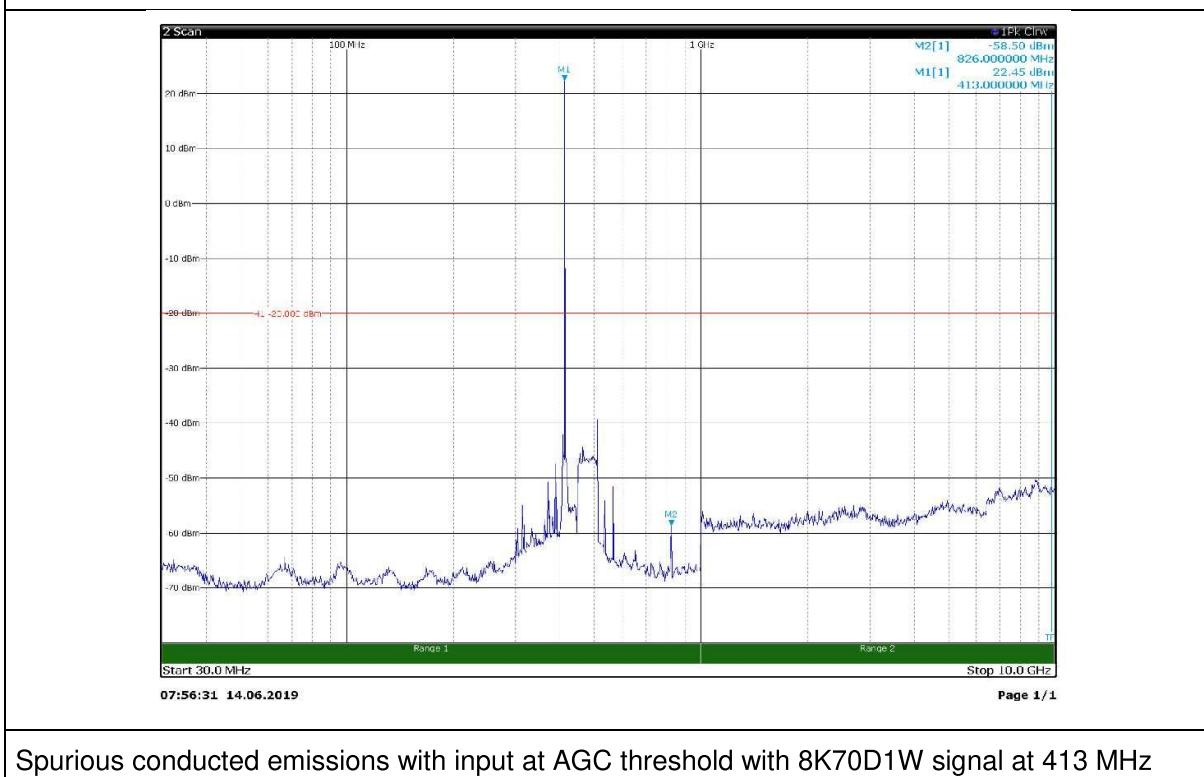
Spurious conducted emissions with input at AGC threshold with CW signal at 413 MHz



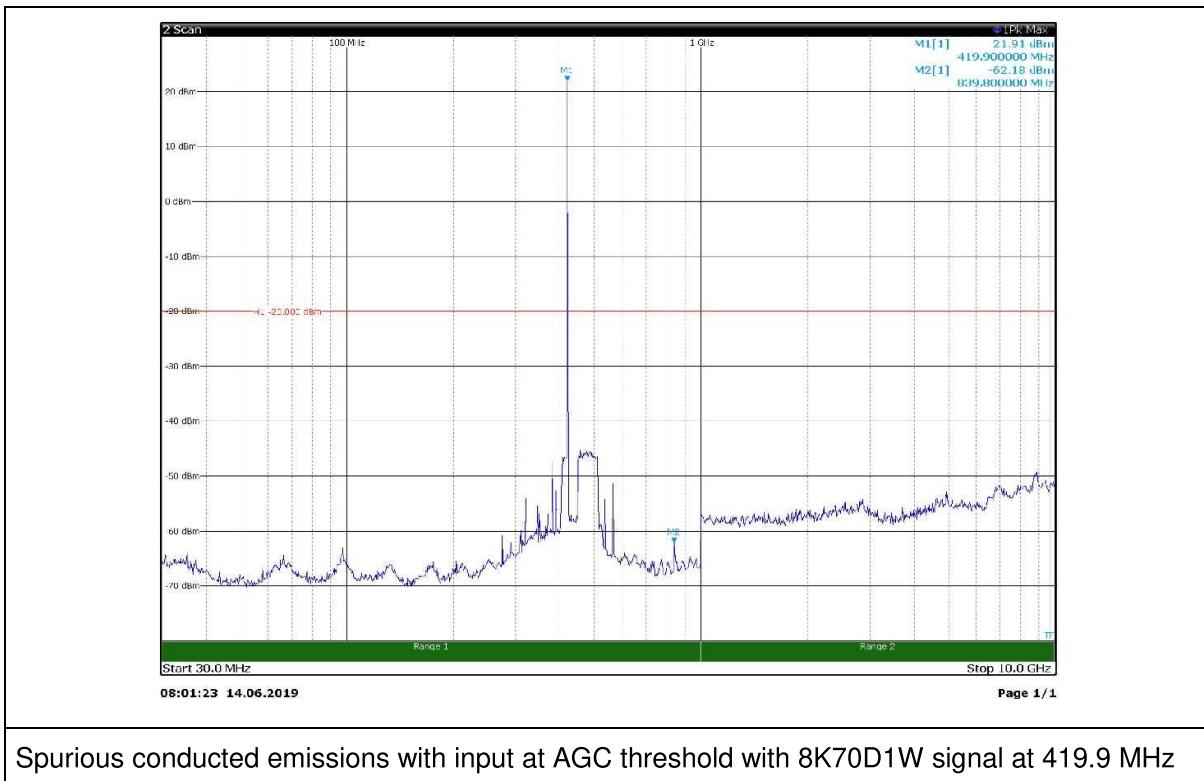
Spurious conducted emissions with input at AGC threshold with CW signal at 419.9 MHz



Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 406.2 MHz



Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 413 MHz



6.8 Frequency stability measurements

FCC 90.213

Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

[Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	¹²³ 100	100	200
25-50	20	20	50
72-76	5		50
150-174	⁵¹¹ 5	⁶ 5	⁴⁶ 50
216-220	1.0		1.0
220-222 ¹²	0.1	1.5	1.5
421-512	⁷¹¹¹⁴ 2.5	⁸ 5	⁸ 5
806-809	¹⁴ 1.0	1.5	1.5
809-824	¹⁴ 1.5	2.5	2.5
851-854	1.0	1.5	1.5
854-869	1.5	2.5	2.5
896-901	¹⁴ 0.1	1.5	1.5
902-928	2.5	2.5	2.5
902-928 ¹³	2.5	2.5	2.5
929-930	1.5		
935-940	0.1	1.5	1.5
1427-1435	⁹ 300	300	300
Above 2450 ¹⁰			

¹Fixed and base stations with over 200 watts transmitter power must have a frequency stability of 50 ppm except for equipment used in the Public Safety Pool where the frequency stability is 100 ppm.

²For single sideband operations below 25 MHz, the carrier frequency must be maintained within 50 Hz of the authorized carrier frequency.

³Travelers information station transmitters operating from 530-1700 kHz and transmitters exceeding 200 watts peak envelope power used for disaster communications and long distance circuit operations pursuant to §§90.242 and 90.264 must maintain the carrier frequency to within 20 Hz of the authorized frequency.

⁴Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.

⁵In the 150-174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

⁶In the 150-174 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth or designed to operate on a frequency specifically designated for itinerant use or designed for low-power operation of two watts or less, must have a frequency stability of 5.0 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 2.0 ppm.

⁷In the 421-512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.

⁸In the 421-512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

⁹Fixed stations with output powers above 120 watts and necessary bandwidth less than 3 kHz must operate with a frequency stability of 100 ppm. Fixed stations with output powers less than 120 watts and using time-division multiplex, must operate with a frequency stability of 500 ppm.

¹⁰Except for DSRCS equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850-5925 MHz band is specified in subpart M of this part.

¹¹Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

¹²Mobile units may utilize synchronizing signals from associated base stations to achieve the specified carrier stability.

¹³Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 kHz from the band edge, intermittently operated hand-held readers, and mobile transponders are not subject to frequency tolerance restrictions.

¹⁴Control stations may operate with the frequency tolerance specified for associated mobile frequencies.

(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.

RSS-119 clause 5.3

The carrier frequency shall not depart from the reference frequency in excess of the values given in Table 1. For transmitters that have an output power of less than 120 mW, the frequency stability shall comply with the limits listed in Table 1 or, alternatively, with the conditions in Section 5.10.

For fixed and base station equipment, in lieu of meeting the frequency stability limit specified in Table 1, the test report can show that the frequency stability is met by demonstrating that the unwanted emission limits, related to the equipment's nominal carrier frequency measured under normal operation, are met when the equipment is tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

Table 1 — Transmitter Frequency Stability

Frequency Band (MHz)	Channel Bandwidth (kHz)	Frequency Stability (ppm)		
		Base/Fixed	Mobile Station	
			Output Power >2 W	Output Power ≤2 W
406.1-430 and 450-470 6	25	0.5	1	1
	25	2.5	5	5
	12.5	1.5	2.5	2.5
	6.25	0.5	1	1



Test date: 2019-06-18 and 2019-06-19
Test results: Pass

Special notes
Modulation used: CW.

Test data			
Test conditions	Frequency, GHz	Drift, Hz	ppm

Test conditions	Frequency, GHz	Drift, Hz	ppm
+50 °C, Nominal	412.999.692	8	0,02
+40 °C, Nominal	412.999.678	22	0,05
+30 °C, Nominal	412.999.656	44	0,11
+20 °C, +15 %	412.999.693	7	0,02
+20 °C, Nominal	412.999.700	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	412.999.699	1	0,00
+10 °C, Nominal	412.999.691	9	0,02
0 °C, Nominal	412.999.690	10	0,02
-10 °C, Nominal	412.999.674	26	0,06
-20 °C, Nominal	412.999.667	33	0,08
-30 °C, Nominal	412.999.647	53	0,13

6.9 Spurious emissions radiated measurements

FCC 90.210(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:

- (10) 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.
- (11) 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.
- (12) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

FCC 90.210(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:

- (13) 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;
- (14) 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 $29 \log (f_d/11)$ dB or 50 dB, whichever is the lesser attenuation;
- (15) 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.
- (16) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:
 - (vii) For stations of point-to-point systems in the fixed service: -45 dBW/27 MHz.
 - (viii) For stations in the mobile service: -60 dBW/27 MHz.

FCC 90.210(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 $7.27(f_d-2.88 \text{ kHz})$ 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.

**RSS-131 clause 6.6(2)**

The retransmitted signals shall meet the unwanted emission limits in the RSS that applies to the equipment with which the zone enhancer is to be used.

RSS-119 clause 5.8.3

Emission Mask D for Transmitters Equipped With or Without an Audio Low-Pass Filter. The power of any emission shall be attenuated below the transmitter output power P (dBW) as specified in Table 7.

Table 7 — Emission Mask D

Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
$5.625 < f_d \leq 12.5$	$7.27(f_d - 2.88)$	Specified in Section 4.2.2
$f_d > 12.5$	Whichever is the lesser: 70 or $50 + 10 \log_{10}(p)$	Specified in Section 4.2.2

Test date: 2019-06-10 and 2019-06-11

Test results: Pass

Special notes

Modulation used: CW and 8K70D1W.