Report Reference ID:	372462-4TRFWL

Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Part 90 – Private land mobile radio services RSS-131 Issue 3 Zone Enhancers RSS-119 Issue 12 Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz

Applicant:	**Andrew Wireless Systems** Industriering, 10 – 86675 Buchdorf – Germany
Apparatus:	Carrier Access Point
Model:	CAP M 4/70/80 F-AC; CAP M 4/70/80 F-DC
FCC ID:	XS5-CAPM47080
IC Registration Number:	2237E-CAPM47080

Testing laboratory:	**Nemko Spa** Via del Carroccio, 4 – 20853 Biassono (MB) – Italy

	Name, function and signature	**Date**
Tested by:	Tessa S.  (project handler)	2019-09-06
Reviewed by:	Barbieri P.  (verifier)	2019-09-06

Table of contents

Section 1: Report summary 4
1.1 Test specification
1.2 Statement of compliance
1.3 Exclusions
1.4 Registration number
1.5 Test report revision history
1.6 Limits of responsibility
Section 2: Summary of test results 5
2.1 FCC Part 90, test results
2.2 RSS-131 and RSS-119, test results
Section 3: Equipment under test (EUT) and application details 6
3.1 Applicant details
3.2 Modular equipment
3.3 Product details
3.4 Application purpose
3.5 Certification details
3.6 Composite/related equipment
3.7 Sample information
3.8 EUT technical specifications
3.9 Accessories and support equipment
3.10 Operation of the EUT during testing
3.11 EUT setup diagram
3.12 Software version
Section 4: Engineering considerations 9
4.1 Modifications incorporated in the EUT
4.2 Deviations from laboratory tests procedures
4.3 Technical judgment
Section 5: Test conditions 10
5.1 Deviations from laboratory tests procedures
5.2 Test conditions, power source and ambient temperatures
5.3 Equipment used for the monitoring of the environmental conditions
5.4 Measurement uncertainty
5.5 Test equipment
Section 6: Test results 13
6.1 AGC threshold
6.2 Out-of-band-rejection

6.3 Input-versus-output signal comparison
6.4 Input/output power and amplifier/booster gain
6.5 Noise figure measurements
6.6 Out-of-band/out-of-block emissions conducted measurements
6.7 EUT spurious emissions conducted measurements
6.8 Frequency stability measurements
6.9 Spurious emissions radiated measurements
Appendix A: Block diagrams of test set-ups 51
Appendix B: Photos 52

Section 1: Report summary

1.1 Test specification

Specifications	FCC Part 90 – Private land mobile radio services RSS-131 Issue 3 – Zone Enhancers RSS-119 Issue 12 – Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz

1.2 Statement of compliance

Compliance	In the configuration tested the EUT was found compliant Yes ☒ No ☐ This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Spa. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 90, RSS-131 Issue 3 and RSS-119 Issue 12. The tests were conducted in accordance with ANSI C63.26-2015 and KDB 935210 D05 Indus Booster Basic Meas v01r03.

1.3 Exclusions

Exclusions	None

1.4 Registration number

Test site:	FCC ID number 682159 (10 m Semi anechoic chamber)

1.5 Test report revision history

Revision #	Details of changes made to test report
1	Original report issued

1.6 Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. Nemko Spa authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Section 2: Summary of test results

2.1 FCC Part 90, test results

Part	Methods	Test description	Verdict
--	935210 D05v01r03 Clause 4.2	AGC threshold	Pass
--	935210 D05v01r03 Clause 4.3	Out of band rejection	Pass
90.219(e)(4)	935210 D05v01r03 Clause 4.4	Input-versus-output signal comparison	Pass
90.635(a) 90.219(e)(1)	935210 D05v01r03 Clause 4.5	Input/output power and amplifier/booster gain	Pass
90.219(e)(2)	935210 D05v01r03 Clause 4.6	Noise Figure	Pass
90.543(c) 90.219(e)(3)	935210 D05v01r03 Clause 4.7.2	Out-of-band/out-of-block emissions conducted measurements	Pass
90.543(c) 90.543(f)	935210 D05v01r03 Clause 4.7.3	EUT spurious emissions conducted measurements	Pass
90.213	935210 D05v01r03 Clause 4.8	Frequency stability measurements	Pass
90.543(c)	935210 D05v01r03 Clause 4.9	Spurious emissions radiated measurements	Pass
Notes:			

2.2 RSS-131 and RSS-119, test results

Part	Methods	Test description	Verdict
--	935210 D05v01r03 Clause 4.2	AGC threshold	Pass
--	935210 D05v01r03 Clause 4.3	Out of band rejection	Pass
RSS-131 §6.6(1)(2)	935210 D05v01r03 Clause 4.4	Input-versus-output signal comparison	Pass
RSS-131 §6.2 RSS-119 §5.4	935210 D05v01r03 Clause 4.5	Input/output power and amplifier/booster gain	Pass
RSS-131 §6.4	935210 D05v01r03 Clause 4.6	Noise Figure	Pass
RSS-131 §6.5 RSS-119 §5.8.9.2	935210 D05v01r03 Clause 4.7.2	Out-of-band/out-of-block emissions conducted measurements	Pass
RSS-131 §6.6(2) RSS-119 §5.8.9.2	935210 D05v01r03 Clause 4.7.3	EUT spurious emissions conducted measurements	Pass
RSS-119 §5.3	935210 D05v01r03 Clause 4.8	Frequency stability measurements	Pass
RSS-131 §6.6(2) RSS-119 §5.8.9.2	935210 D05v01r03 Clause 4.9	Spurious emissions radiated measurements	Pass
Notes:			

Section 3: Equipment under test (EUT) and application details

3.1 Applicant details

Applicant	Name:	Andrew Wireless Systems
	Address:	Industriering, 10
	City:	Buchdorf
	Province/State:	--
	Post code:	86675
	Country:	Germany
	Federal Registration Number (FRN):	--
	Grantee code	--
	IC company number:	--
Manufacturer	Name:	Andrew Wireless Systems
	Address:	Industriering, 10
	City:	Buchdorf
	Province/State:	--
	Post code:	86675
	Country:	Germany
Canadian representative	Name:	Andrew Wireless Systems
	Address:	Industriering, 10
	City:	Buchdorf
	Province/State:	--
	Post code:	86675
	Country:	Germany

3.2 Modular equipment

a) Single modular approval	Single modular approval Yes ☐ No ☒
b) Limited single modular approval	Limited single modular approval Yes ☐ No ☒

3.3 Product details

FCC ID	Grantee code:	XS5
	Product code:	-CAPM47080
IC ID	Proposed certification number:	2237E-CAPM47080
Equipment class	B9B	
Description of product as it is marketed	Carrier Access Point	
	Model name:	CAP M 4/70/80 F-AC; CAP M 4/70/80 F-DC
	Serial number:	TEST 5
Product	The EUT is also classified as Terminal Equipment subject to IC CS-03 No ☒ Yes ☐ Network interface type: Ringer equivalence number: Single line equipment: No ☐ Yes ☐ Terminal equipment category:	

3.4 Application purpose

Type of application	☒ Original certification ☐ Change in identification of presently authorized equipment Original FCC ID: Grant date: ☐ Class II permissive change or modification of presently authorized equipment

3.5 Certification details

Services requested Type of assessment	☒ New certification ☐ New family ☐ Re-assessment ☐ Existing family ☐ Multiple listing

3.6 Composite/related equipment

a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization Yes ☐ No ☒
b) Related equipment	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes ☐ No ☒
c) Related FCC ID	If either of the above is "yes": ☐ has been granted under the FCC ID(s) listed below: ☐ is in the process of being filled under the FCC ID(s) listed below: ☐ is pending with the FCC ID(s) listed below: ☐ has a mix of pending and granted statues under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.7 Sample information

Receipt date:	2019-06-06
Nemko sample ID:	372462-1/2

3.8 EUT technical specifications

Operating band:	769 – 775 MHz
Operating frequency:	Wideband
Modulation type:	F3E, D7W and D1W
Occupied bandwidth:	12.5 kHz
Channel spacing:	Standard
Emission designator:	F3E, D7W and D1W
RF Output	Down Link: 31 dBm (1.26 W) Up Link: The EUT does not transmit over the air in the up-link direction
Gain	Down Link: 31 dB Up Link: The EUT does not transmit over the air in the up-link direction
Antenna type:	equipment with a 50 Ω RF connector (antenna not provided)
Power source:	100-240 Vac

3.9 Accessories and support equipment

The following information identifies accessories used to exercise the EUT during testing:

Item # 1	
Type of equipment:	Rack
Brand name:	CommScope
Model name or number:	7642110-01
Serial number:	21319110463
Connection port:	--
Cable length and type:	--
Item # 2	
Type of equipment:	SUI Card
Brand name:	CommScope
Model name or number:	7642125-00
Serial number:	SZBEAC1839A0009
Connection port:	LAN port
Cable length and type:	2 m standard cable
Item # 3	
Type of equipment:	OPT Card
Brand name:	CommScope
Model name or number:	7642123-00
Serial number:	SZBEAD1737A0070
Connection port:	Optical port
Cable length and type:	10 m optical fiber
Item # 4	
Type of equipment:	2 x RFD Card
Brand name:	CommScope
Model name or number:	7633229-02
Serial number:	SZBEAP1919A0036 and SZBEAP1919A0023
Connection port:	RF port with QMA connector
Cable length and type:	1 m Coaxial cable
Item # 5	
Type of equipment:	Power supply unit
Brand name:	CommScope
Model name or number:	7693531-00 with 7663610-00
Serial number:	PSU_1_0 + PSU12V_1_0
Connection port:	AC mains
Cable length and type:	1.5 m standard cable

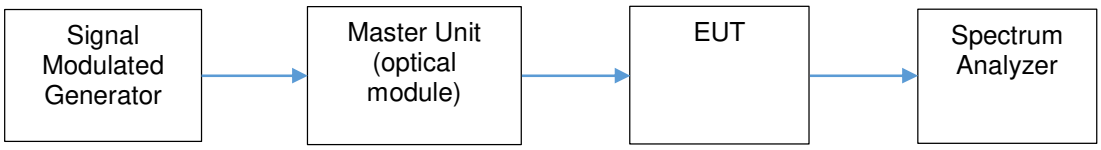
3.10 Operation of the EUT during testing

Details:	In down-link direction, normal working at max gain with max RF power output.

3.11 EUT setup diagram

In this system, Remote Unit is the EUT. Master Unit includes only management module and optical module (to convert RF signal in optical signal in down link direction and vice versa optical signal in RF signal in up link direction). As described in "Operational description", master unit is connected directly to base station, so the system doesn't use another equipment to exercise the EUT. Signal generator is linked directly to the RF connector of the RFD card in the Master Unit.

Test setup:



Procedure

Connect the signal modulated generator to the input of the EUT, so that the EUT works at the max gain. Raise the input level to the EUT until reach the maximum output power. Connect the spectrum analyzer to the RF output connector of the EUT.

3.12 Software version

Details:	**ERA and ION-E Software V 2.7** (SW is preloaded into ERA systems and to setup the system it's required a connection through LAN and access to html setup page).

Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

Modifications	Modifications performed to the EUT during this assessment None ☒ Yes ☐, performed by Client ☐ or Nemko ☐ Details:

4.2 Deviations from laboratory tests procedures

Deviations	Deviations from laboratory test procedures None ☒ Yes ☐ - details are listed below:

4.3 Technical judgment

Judgment	None

Section 5: Test conditions

5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

5.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Unless different values are declared in the test case, following ambient conditions apply for the tests: Temperature: 18 ÷ 33 °C Relative humidity: 30 ÷ 60 % Air pressure: 980 ÷ 1060 hPa When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

5.3 Equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Thermohygrometer data loggers	Testo	175-H2	38203337/703
Barometer	MSR	MSR145B	330080

5.4 Measurement uncertainty

EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	10 kHz ÷ 30 MHz	1.0 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	10 kHz ÷ 26 GHz	3.0 dB	(1)
			26 GHz ÷ 40 GHz	4.5 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 40 GHz	8.0 dB	(1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26,5 GHz ÷ 40 GHz	8.0 dB	(1)
Receiver	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 40 GHz	8.0 dB	(1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	10 kHz ÷ 26 GHz	3.0 dB	(1)
			26 GHz ÷ 40 GHz	4.5 dB	(1)

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %

5.5 Test equipment

Equipment	Manufacturer	Model	Serial N°	Cal Date	Due Date
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2018-07	2021-07
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2018-08	2019-08
EMI receiver (9 kHz ÷ 3 GHz)	Rohde & Schwarz	ESCI	100888	2018-09	2019-09
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	2019-01	2020-01
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	2018-08	2019-08
Signal generator	Rohde & Schwarz	SMBV100A	263397	2018-09	2019-09
Signal generator	Rohde & Schwarz	SMBV100A	263254	2019-03	2020-03
Semi-anechoic chamber	Nemko	10 m semi-anechoic chamber	530	2018-09	2021-09
Shielded room	Siemens	10 m control room	1947	NSC	--

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

Section 6: Test results

6.1 AGC threshold

Test performed according to KDB 935210 D05 Indus Booster Basic Meas v01r03 clause 4.2.

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

The AGC threshold level is 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.

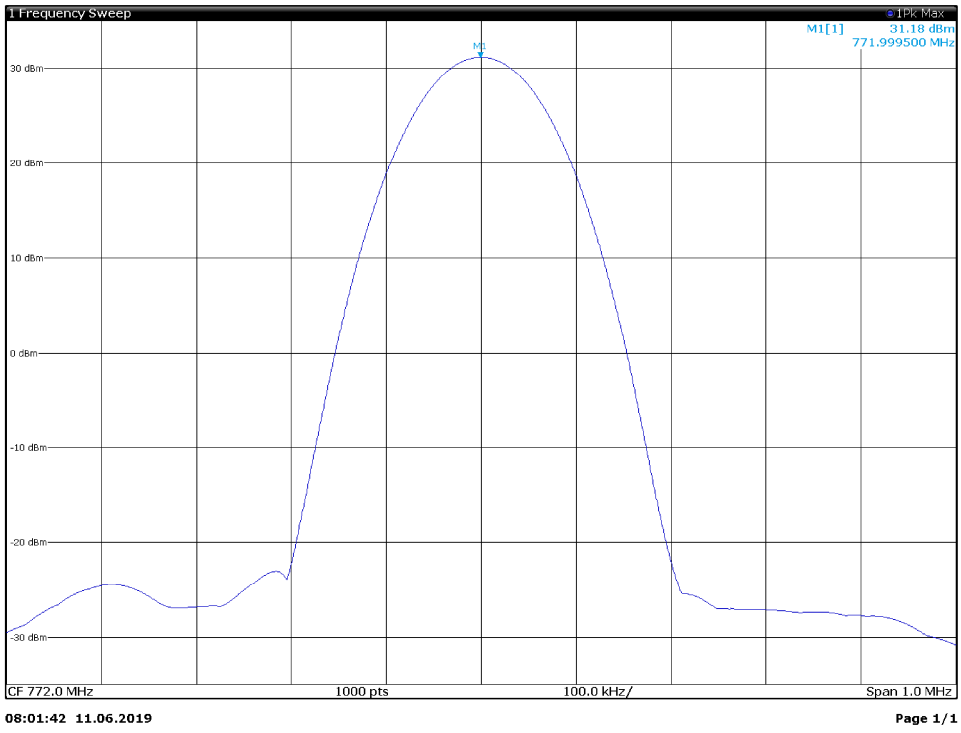
Test date: 2019-06-11

Test results: Pass

Special notes

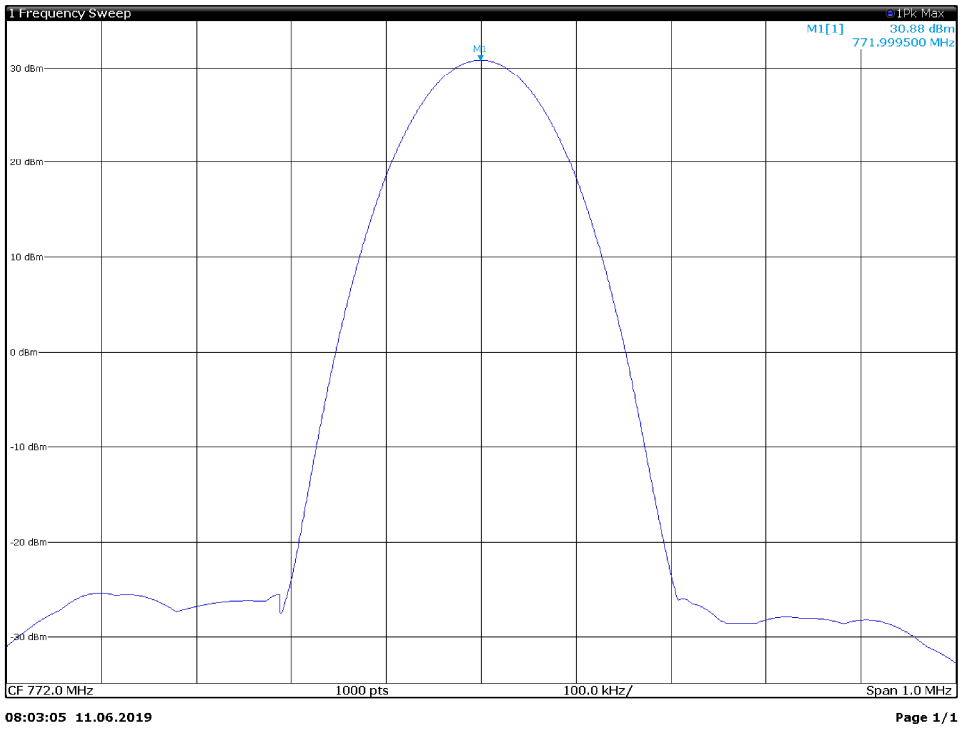
Modulation used: CW, 11K0F3E and 8K70D1W

Test data



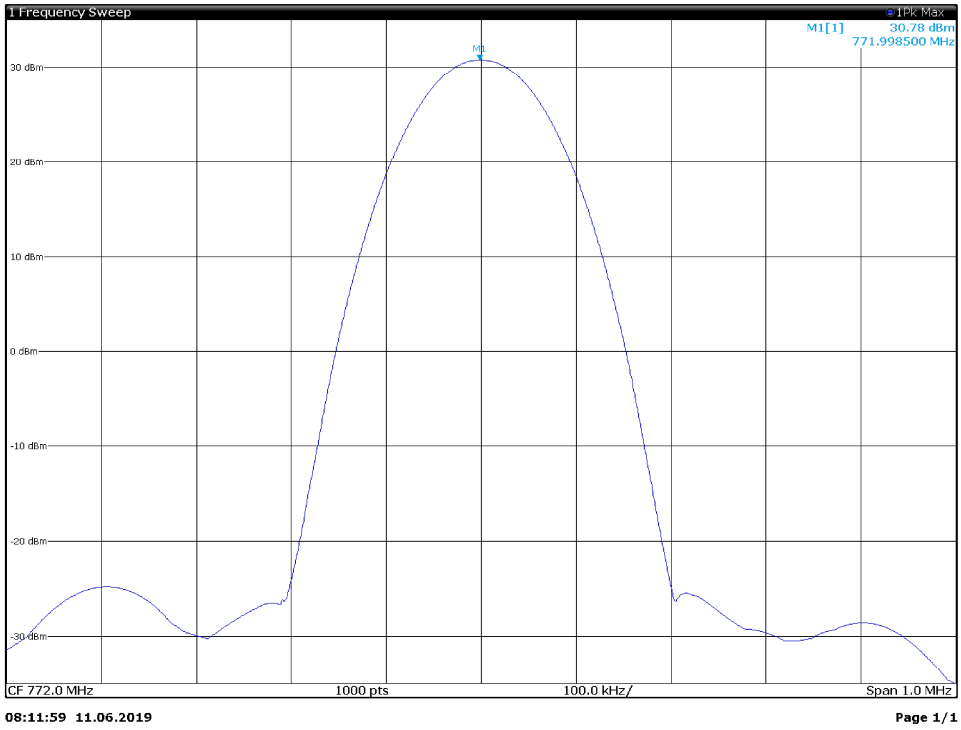
Output spectral plot with input at AGC threshold with CW signal at 772 MHz

Test data



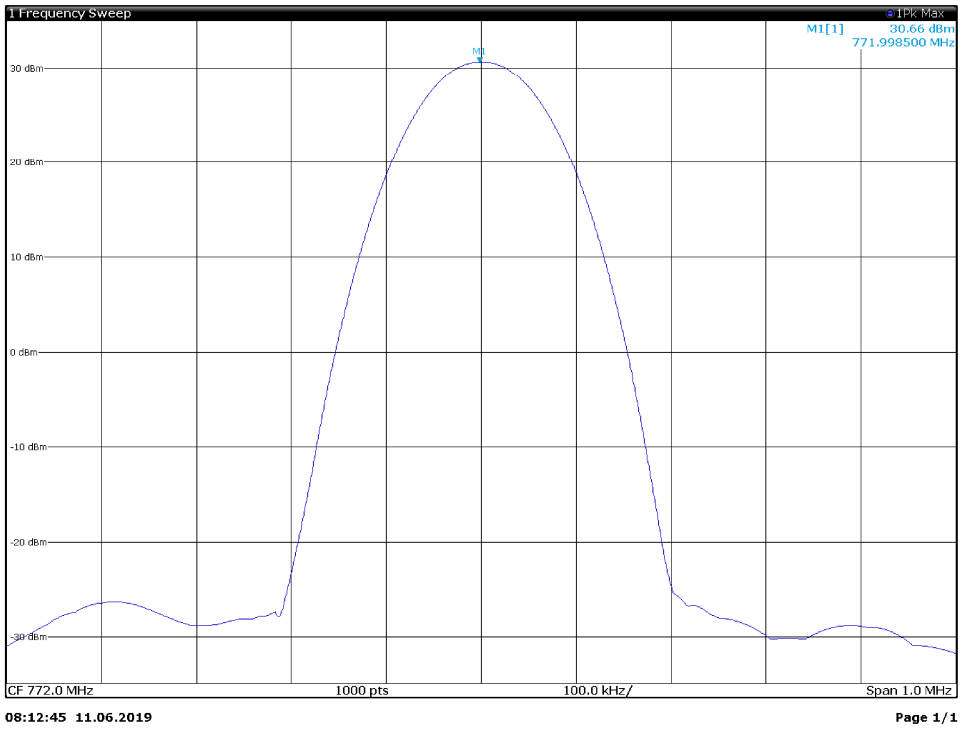
Output spectral plot with input at AGC threshold + 1 dB with CW signal at 772 MHz

Test data



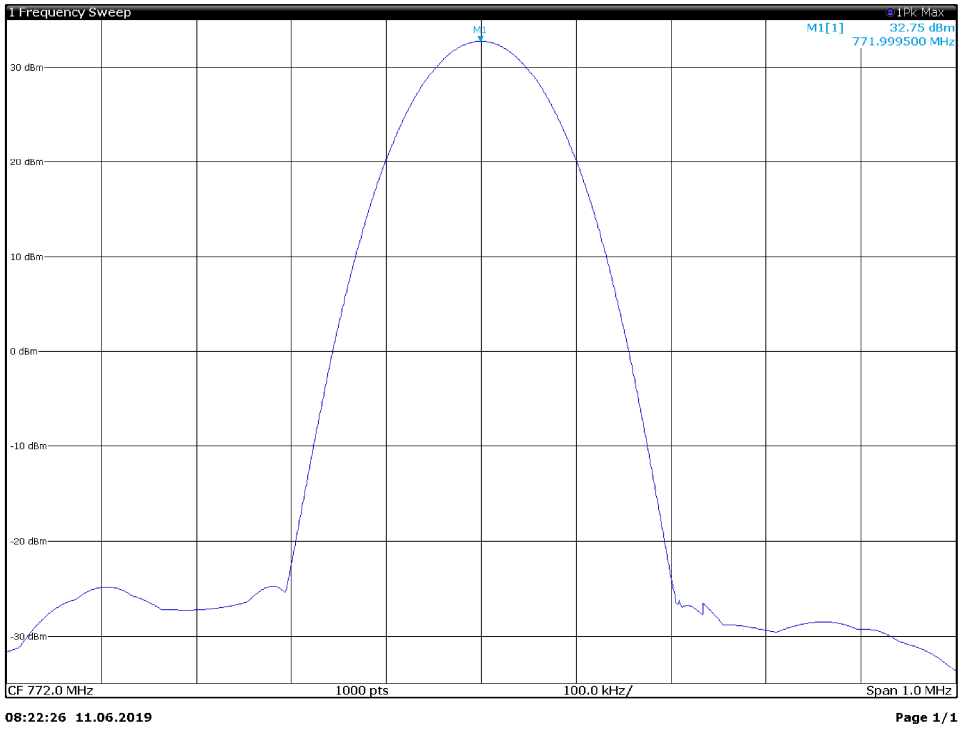
Output spectral plot with input at AGC threshold with 11K0F3E signal at 772 MHz

Test data



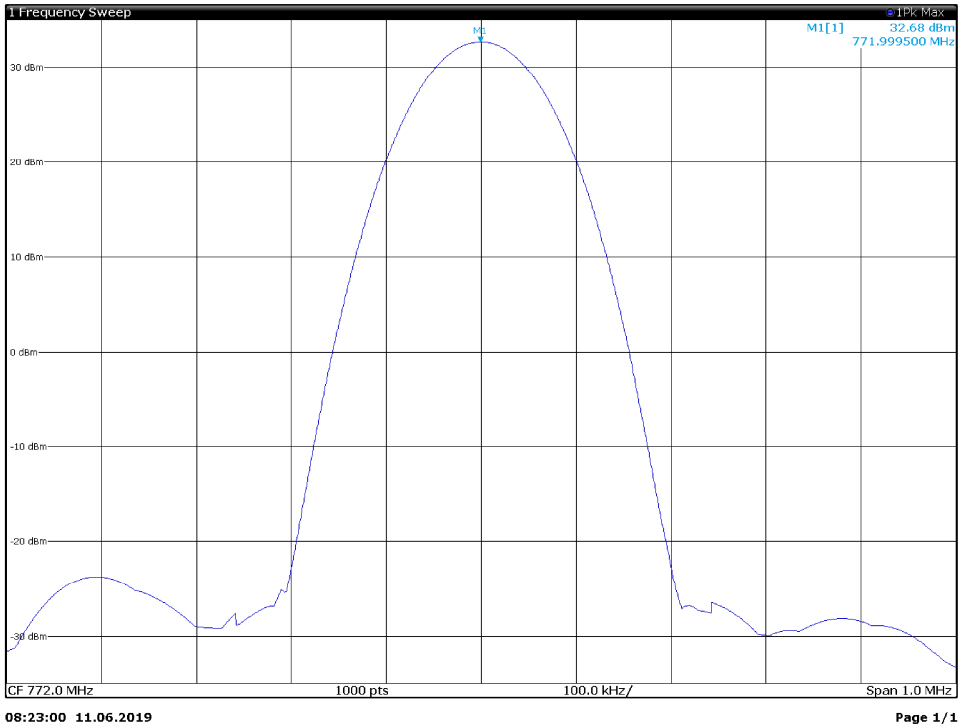
Output spectral plot with input at AGC threshold + 1 dB with 11K0F3E signal at 772 MHz

Test data



Output spectral plot with input at AGC threshold with 8K70D1Wsignal at 772 MHz

Test data



Output spectral plot with input at AGC threshold + 1 dB with 8K70D1Wsignal at 772 MHz

6.2 Out-of-band-rejection

Test performed according to KDB 935210 D05 Indus Booster Basic Meas v01r03 clause 4.3. The gain-versus-frequency response and the 20 dB bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

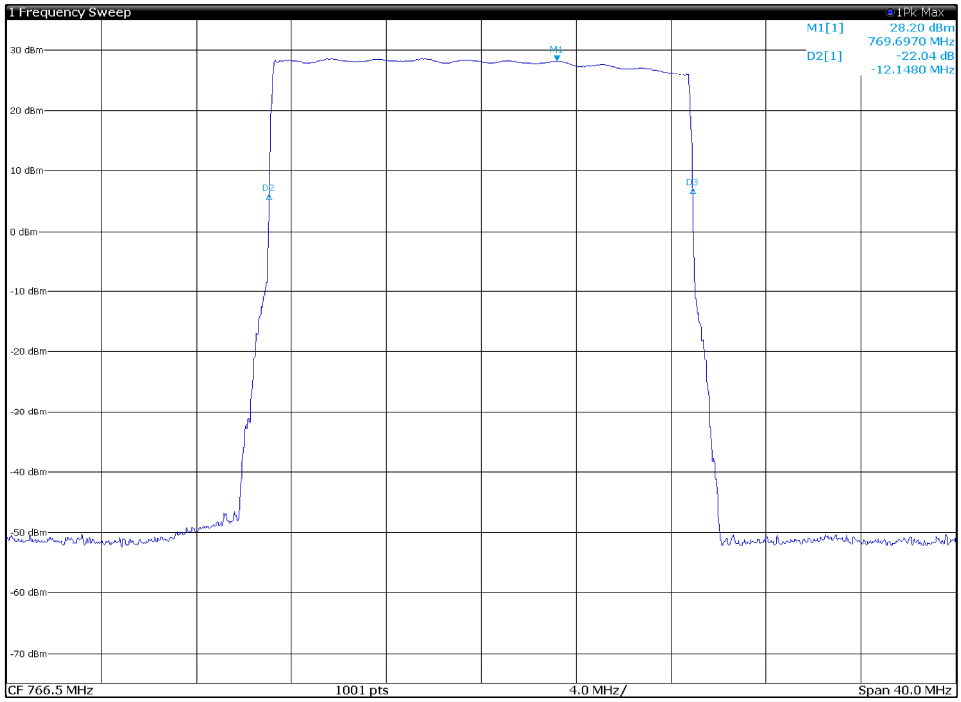
Test date: 2019-06-07

Test results: Pass

Special notes

Modulation used: CW

Test data



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**769.697 MHz**	**28.20 dBm**		
D2	M1	1	**-12.148 MHz**	**-22.04 dB**		
D3	M1	1	**5.714 MHz**	**-21.09 dB**		

6.3 Input-versus-output signal comparison

FCC 90.219(e)(4)

A signal booster must be designed such that all signals that it retransmits meet the following requirements:

(i) The signals are retransmitted on the same channels as received. Minor departures from the exact provider or reference frequencies of the input signals are allowed, *provided that* the retransmitted signals meet the requirements of § 90.213.

(ii) There is no change in the occupied bandwidth of the retransmitted signals.

(iii) The retransmitted signals continue to meet the unwanted emissions limits of § 90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).

RSS-131 clause 6.6(1)(2)

Zone enhancers shall meet the following requirements:

1. minor departures from the exact reference frequencies of the input signals are permitted provided the retransmitted signals meet the frequency stability limit specified in RSS-119 for the equipment with which the zone enhancer is to be used
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.

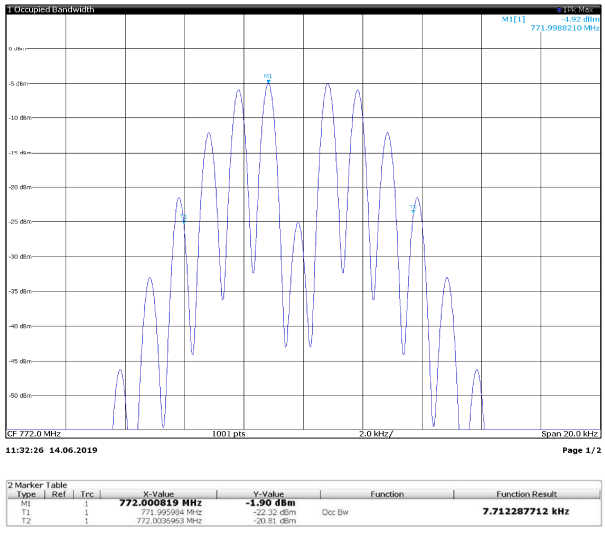
Test date: 2019-06-14

Test results: Pass

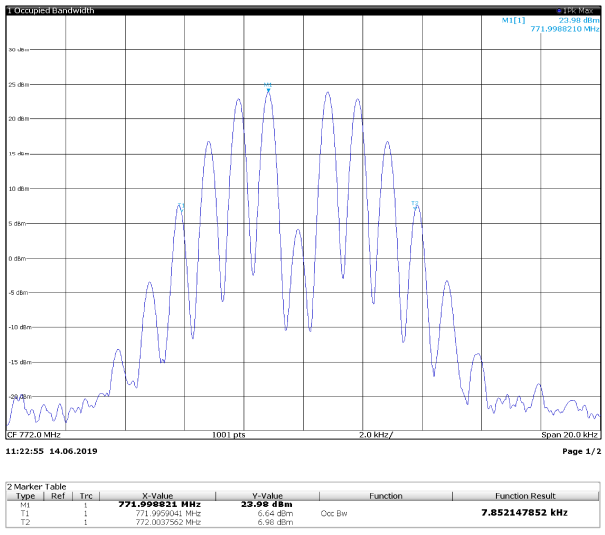
Special notes

Modulation used: 11K0F3E and 8K70D1W

Test data



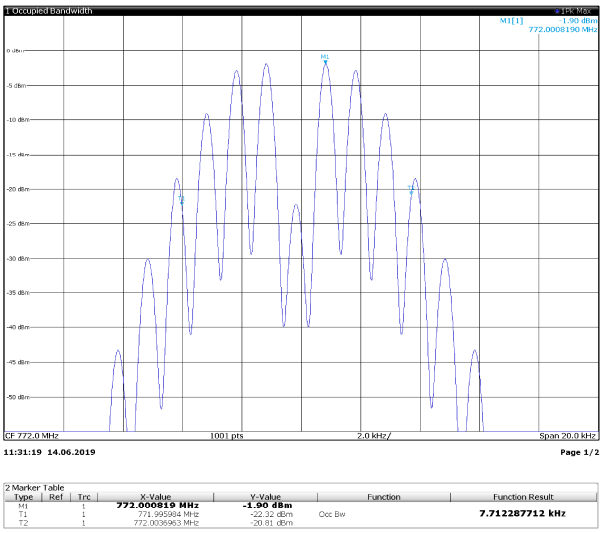
Input

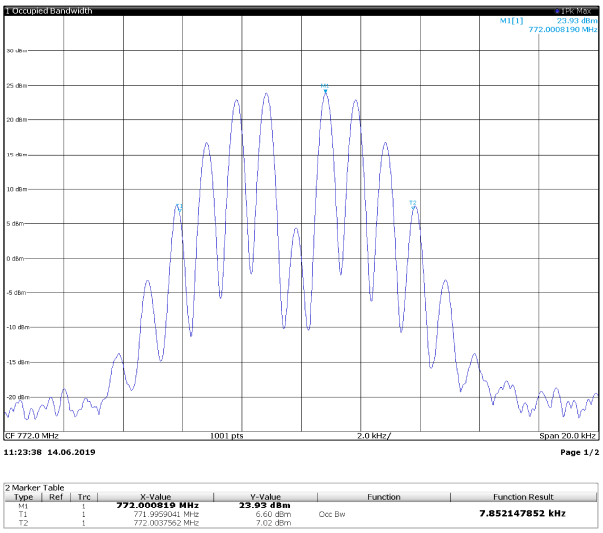


Output

99% occupied band with input at AGC threshold with 11K0F3E signal at 772 MHz

Test data

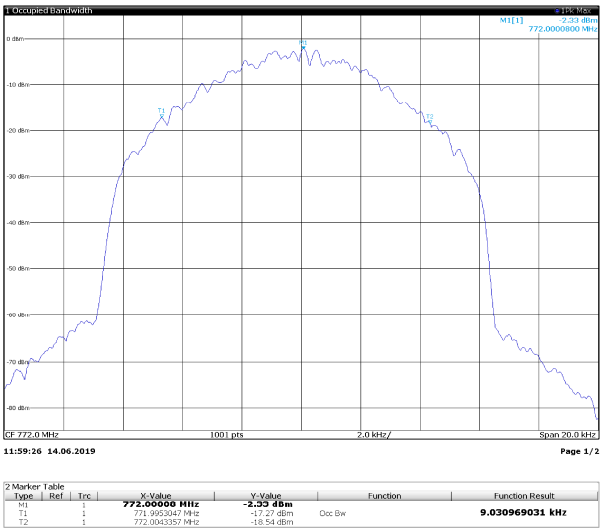


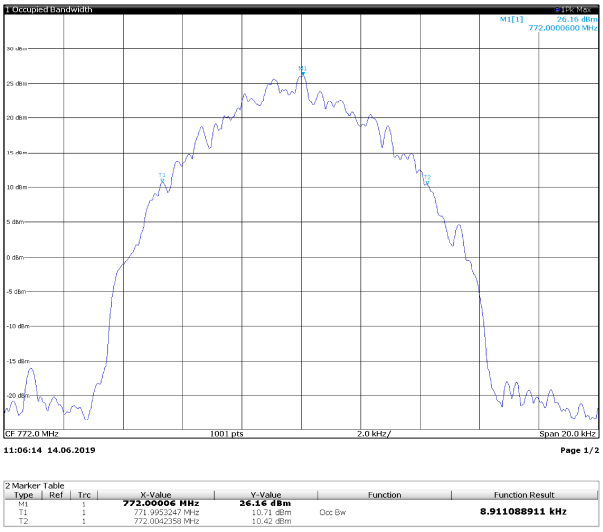


Input	Output

99% occupied band input at AGC threshold +3dB with 11K0F3E signal at 772 MHz

Test data

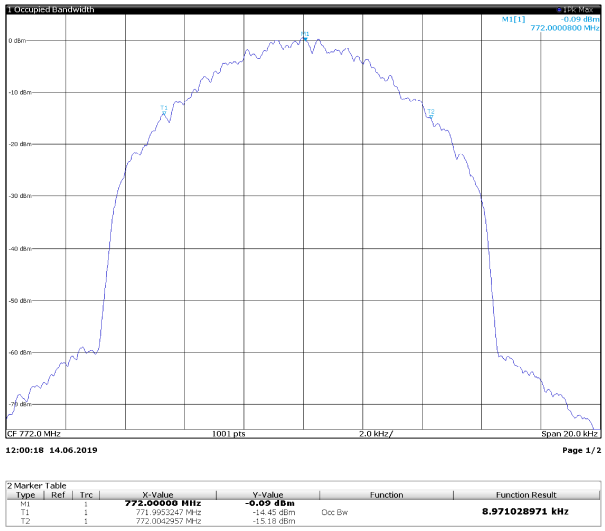




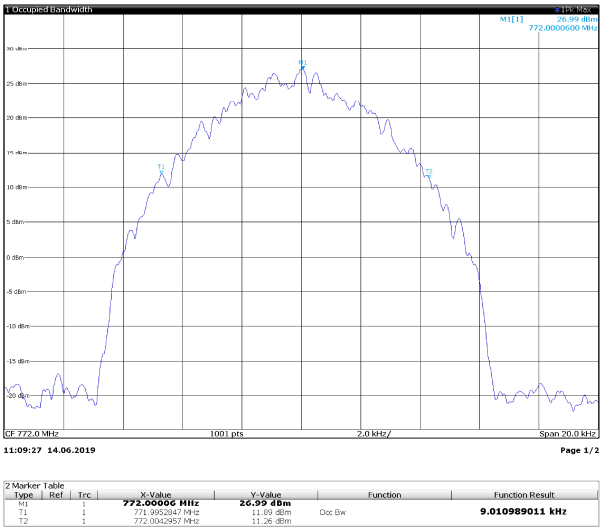
Input	Output

99% occupied band with input at AGC threshold with 8K70D1W signal at 772 MHz

Test data



Input



Output

99% occupied band input at AGC threshold +3dB with 8K70D1W signal at 772 MHz

6.4 Input/output power and amplifier/booster gain

FCC 90.635(a)

The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

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.

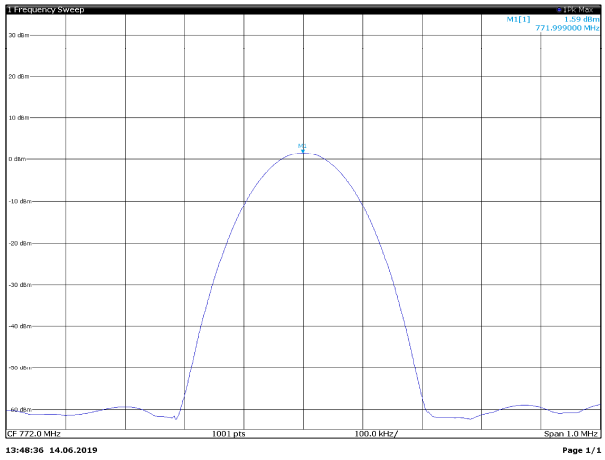
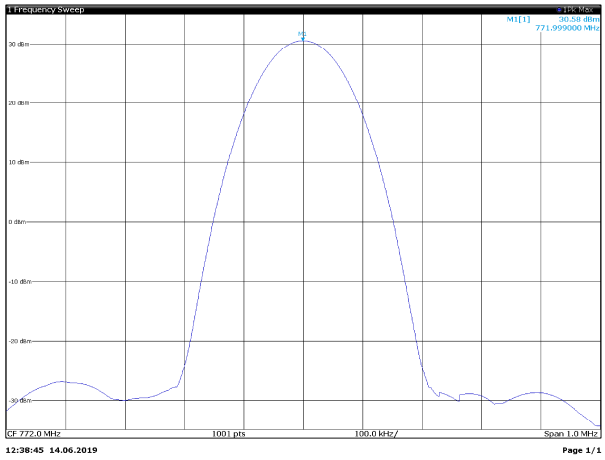
Table 2 —Transmitter Output Power

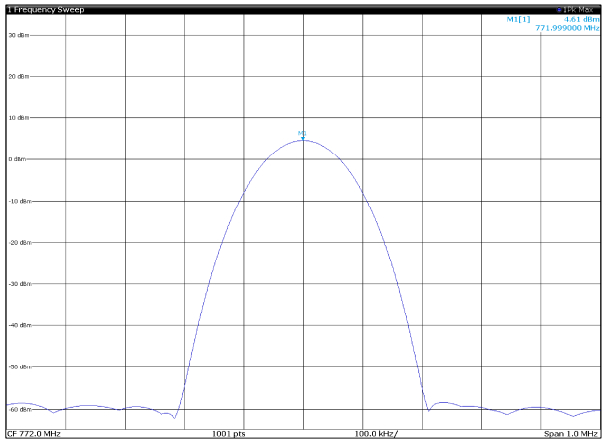
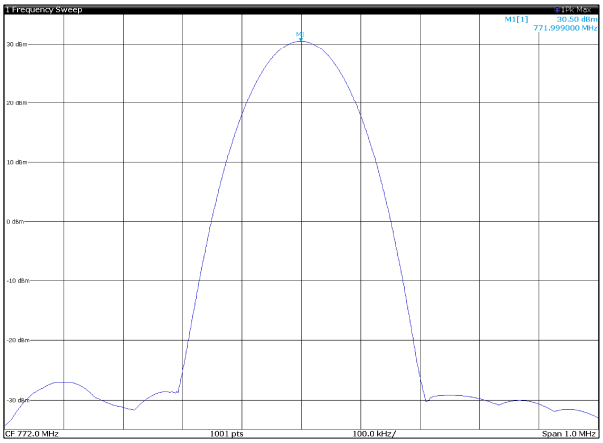
Frequency Bands (MHz)	Transmitter Output Power (W)	
	Base/Fixed Equipment	Mobile Equipment
27.41-28 and 29.7-50	300	30
72-76	No limit	1
138-174	110	60
217-218 and 219-220	110	30
220-222	See SRSP-512 for ERP limit	50
406.1-430 and 450-470	110	60
768-776 and 798-806	See SRSP-511 for ERP limit	30 3 W ERP 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

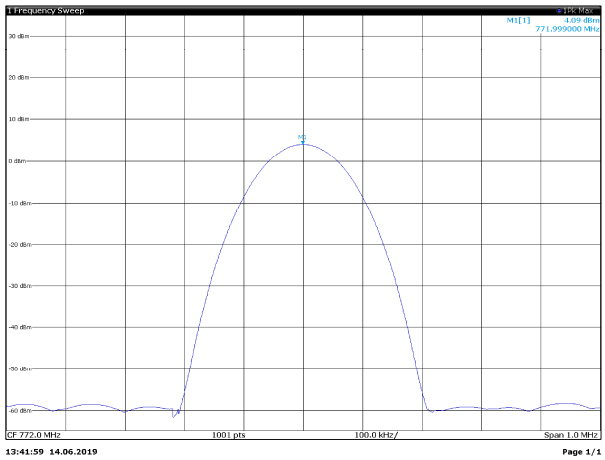
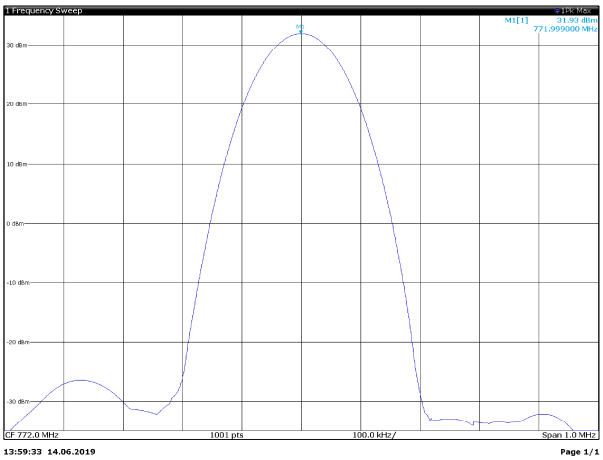
Test date: 2019-06-14
Test results: Pass

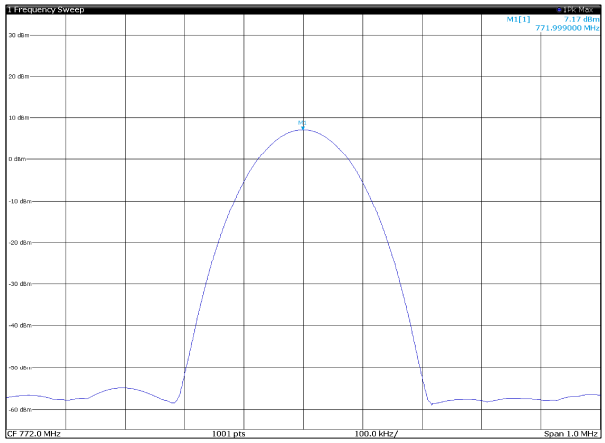
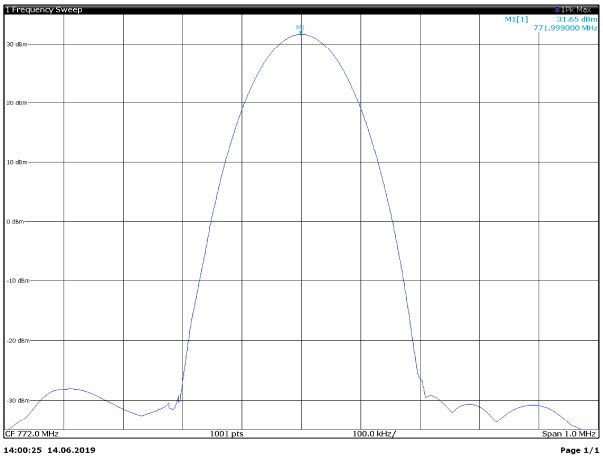
Special notes
Modulation used: CW and 8K70D1W

Test data
Gmax antenna gain (dBi) = 39.14 - 31.93 = 7.21 dBi

Test data	
	
Input	Output
Output power with input at AGC threshold with CW signal at 772 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 28.99	

	
Input	Output
Output power with input at AGC threshold +3 dB with CW signal at 772 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 28.99	

	
Input	Output
Output power with input at AGC threshold with 8K70D1W signal at 772 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 27.84	

	
Input	Output
Output power with input at AGC threshold + 3 dB with 8K70D1W signal at 772 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 24.48	

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: 2019-06-26

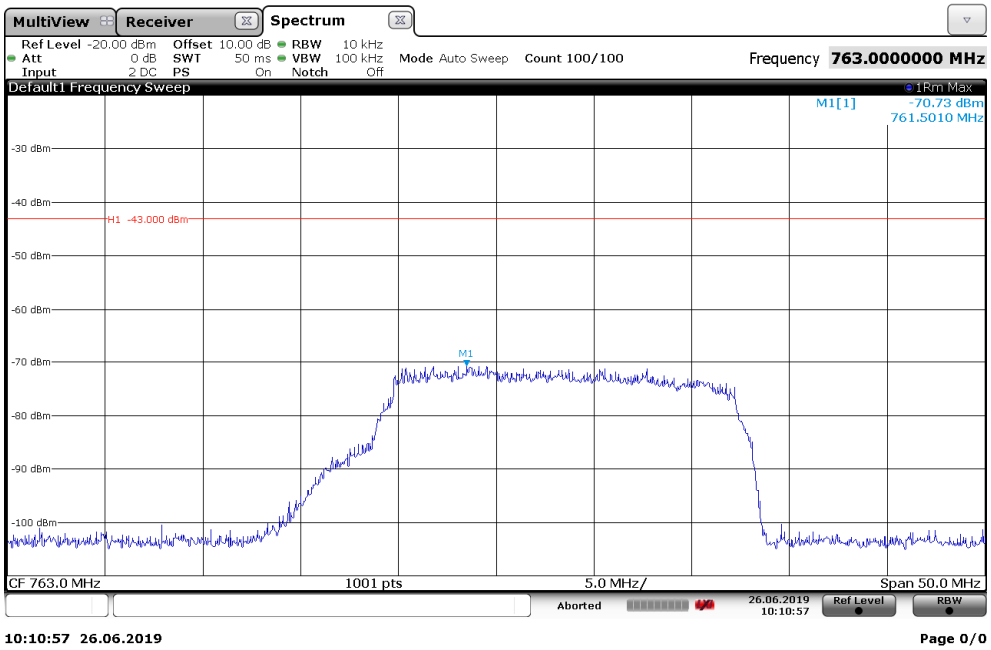
Test results: Pass

Special notes

Spectrum analyzer settings:

Resolution bandwidth	10 kHz
Video bandwidth	≥3 × RBW
Frequency span	25 MHz
Detector mode	Rms
Trace mode	Max Hold

Test data


MultiView
Receiver
Spectrum
Ref Level -20.00 dBm
Offset 10.00 dB
RBW 10 kHz
Att 0 dB
SWT 50 ms
VBW 100 kHz
Mode Auto Sweep
Count 100/100
Frequency 763.0000000 MHz
Input 2 DC
PS On
Notch Off
Default1 Frequency Sweep
1Rm Max
M1[1] -70.73 dBm
761.5010 MHz
-30 dBm
-40 dBm
H1 -43.000 dBm
-50 dBm
-60 dBm
-70 dBm
M1
-80 dBm
-90 dBm
-100 dBm
CF 763.0 MHz
1001 pts
5.0 MHz/
Span 50.0 MHz
Aborted
26.06.2019
10:10:57
Ref Level
RBW
10:10:57 26.06.2019
Page 0/0

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

FCC 90.543(c)
Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

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 5.8.9.2
On any frequency outside of the ranges specified in the ACP tables 13 to 16, the power of any emission shall be attenuated below the mean output power P (dBW) by at least 43 + 10 log10(p), measured in a 100 kHz bandwidth for frequencies less than or equal to 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

In addition, for operations in the bands 768-776 MHz and 798-806 MHz, all emissions (including harmonics in the band 1559-1610 MHz), shall not exceed:
- –70 dBW/MHz equivalent isotropically radiated power (e.i.r.p.) for wideband emissions, and
- –80 dBW/kHz e.i.r.p. for discrete emissions of less than 700 Hz bandwidth.

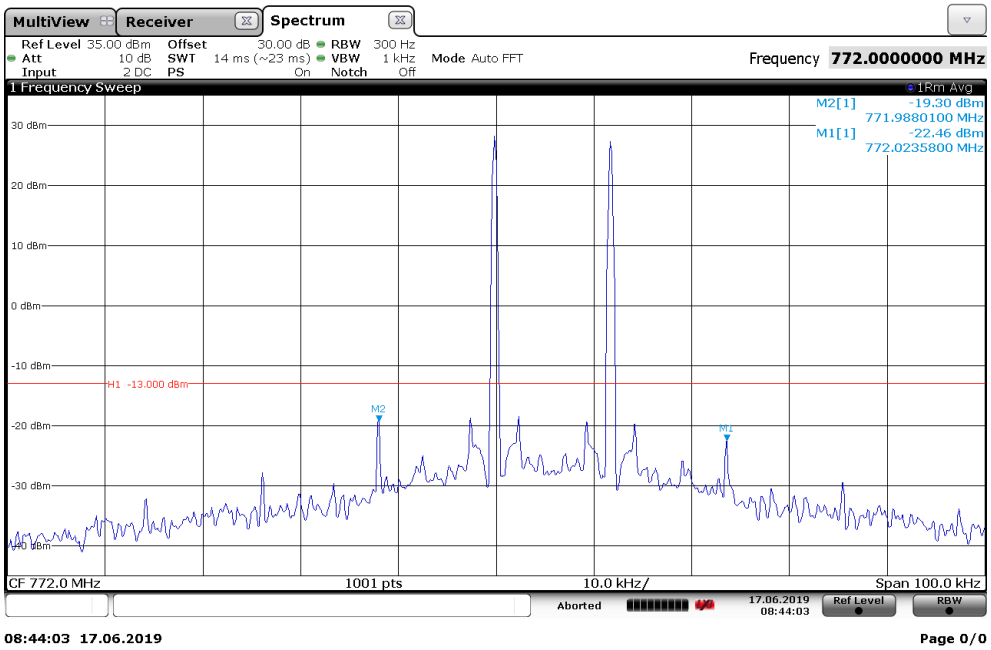
Test date: 2019-06-17

Test results: Pass

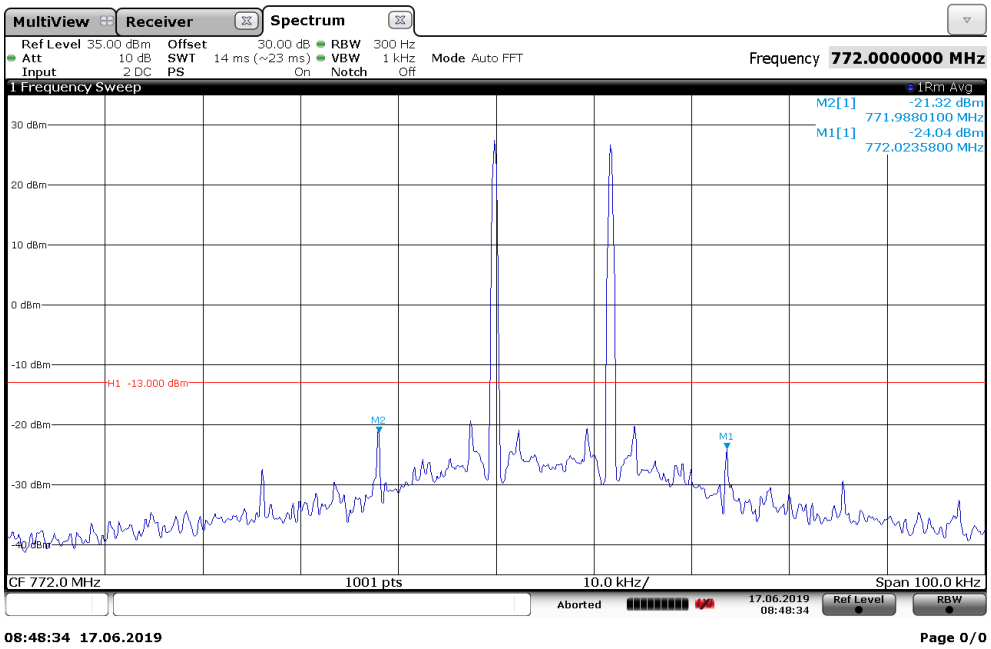
Special notes

Modulation used: CW and 8K70D1W

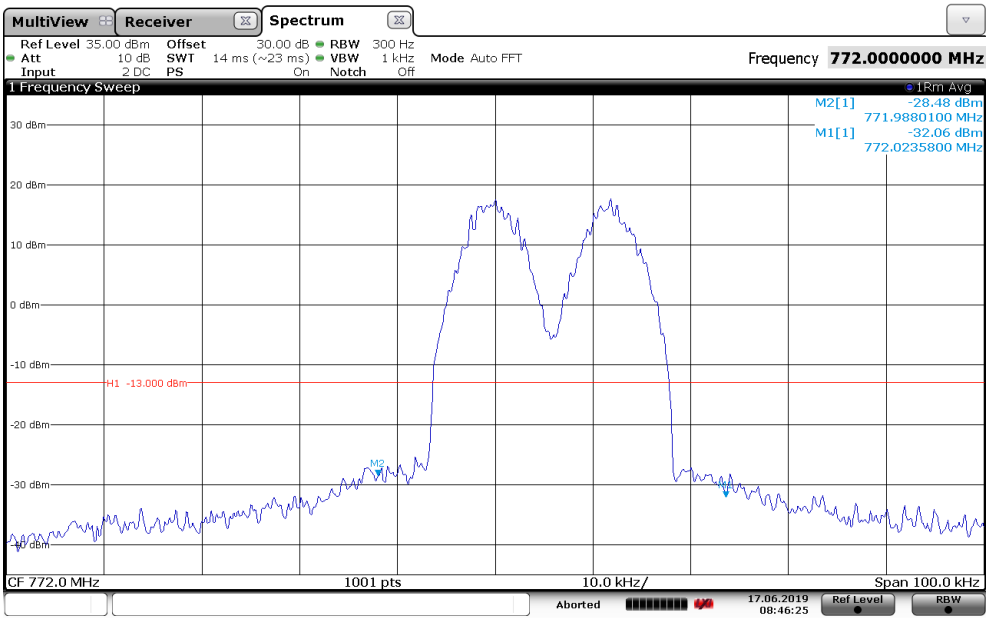
Test data



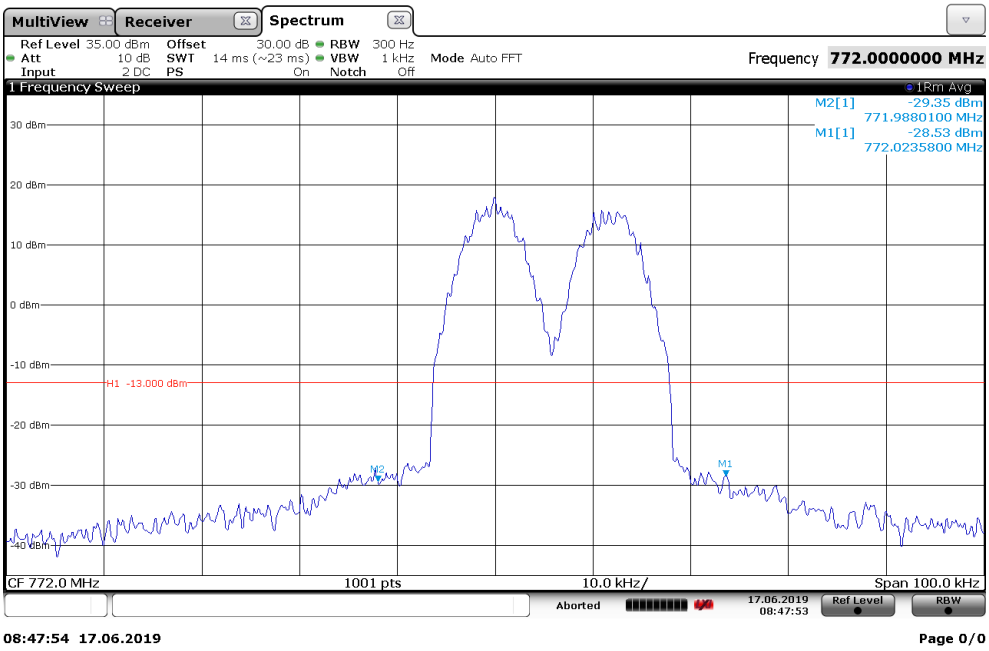
Out of band/out of block with input at AGC threshold with CW signal at 772 MHz



Out of band/out of block with input at AGC threshold + 3 dB with CW signal at 772 MHz



Out of band/out of block with input at AGC threshold with 8K70D1W signal at 772 MHz



Out of band/out of block with input at AGC threshold + 3 dB with 8K70D1W signal at 772 MHz

6.7 EUT spurious emissions conducted measurements

FCC 90.543(c)
Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

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 5.8.9.2
On any frequency outside of the ranges specified in the ACP tables 13 to 16, the power of any emission shall be attenuated below the mean output power P (dBW) by at least 43 + 10 log10(p), measured in a 100 kHz bandwidth for frequencies less than or equal to 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

In addition, for operations in the bands 768-776 MHz and 798-806 MHz, all emissions (including harmonics in the band 1559-1610 MHz), shall not exceed:
- –70 dBW/MHz equivalent isotropically radiated power (e.i.r.p.) for wideband emissions, and
- –80 dBW/kHz e.i.r.p. for discrete emissions of less than 700 Hz bandwidth.

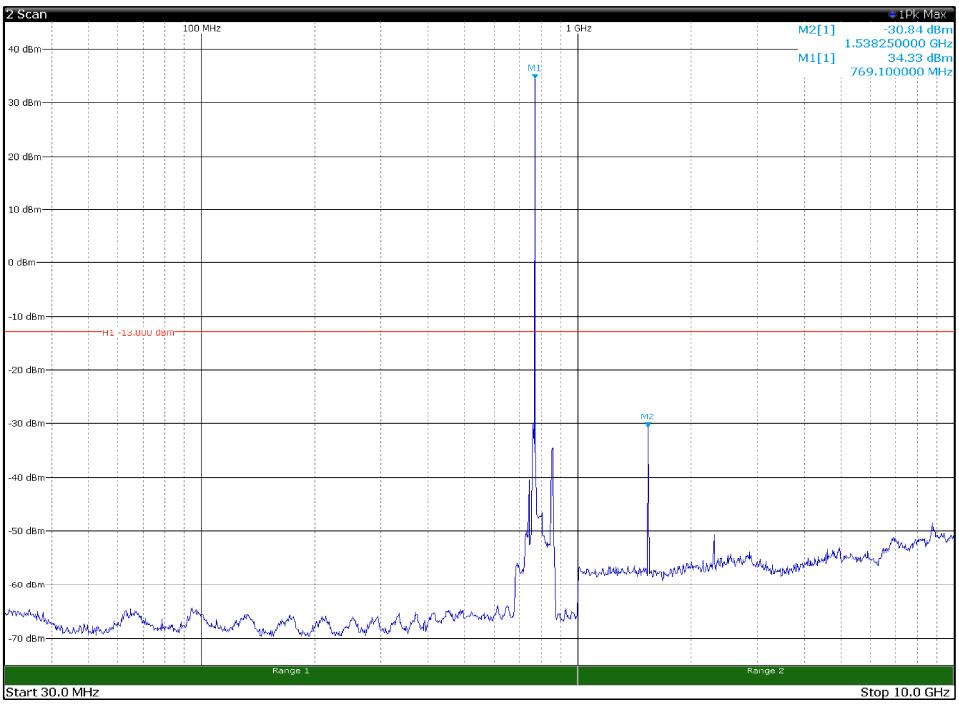
Test date: 2019-06-14

Test results: Pass

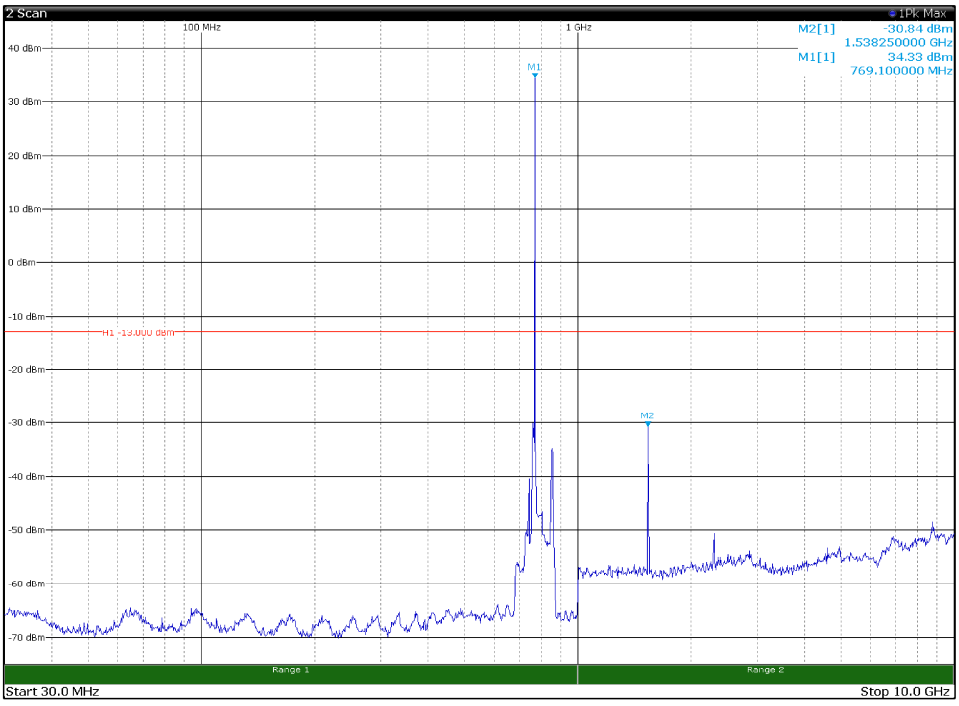
Special notes

Modulation used: CW and 8K70D1W.

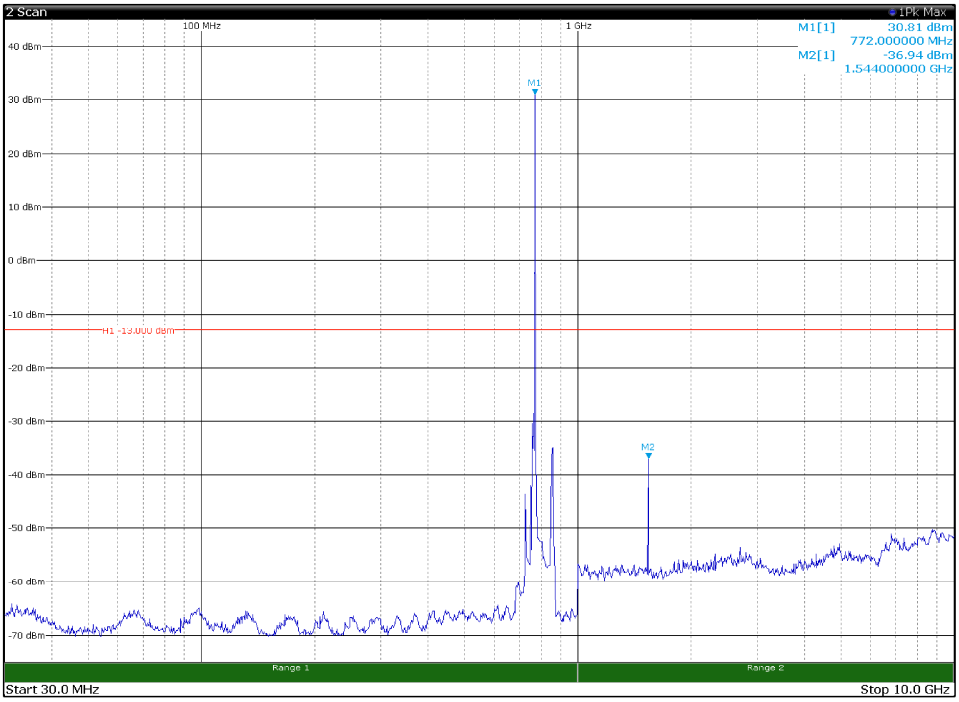
Test data



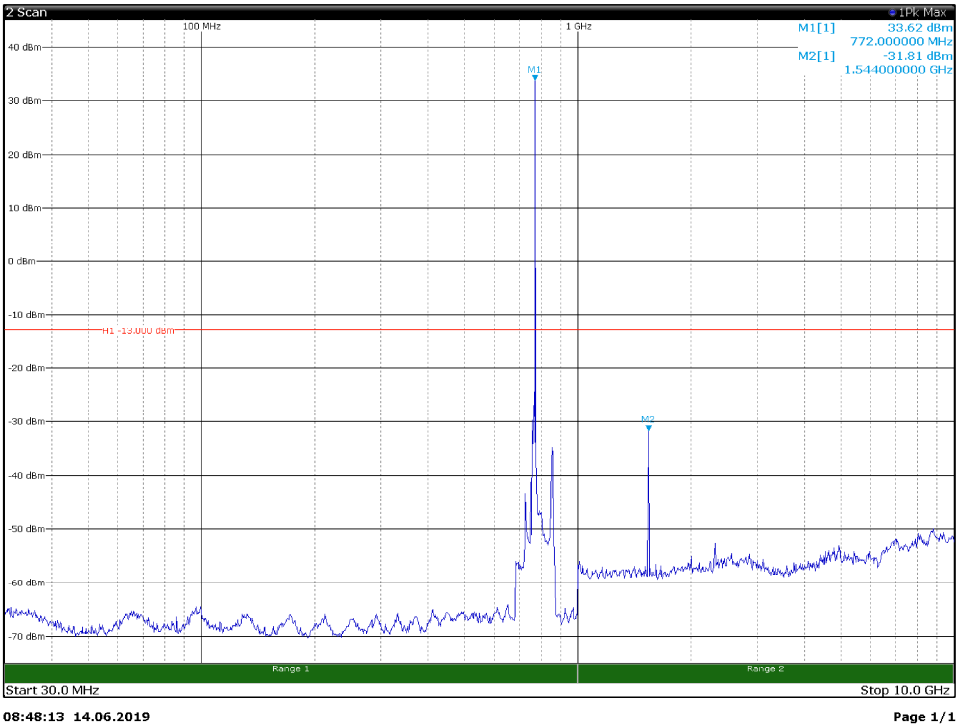
Spurious conducted emissions with input at AGC threshold with CW signal at 769.1 MHz



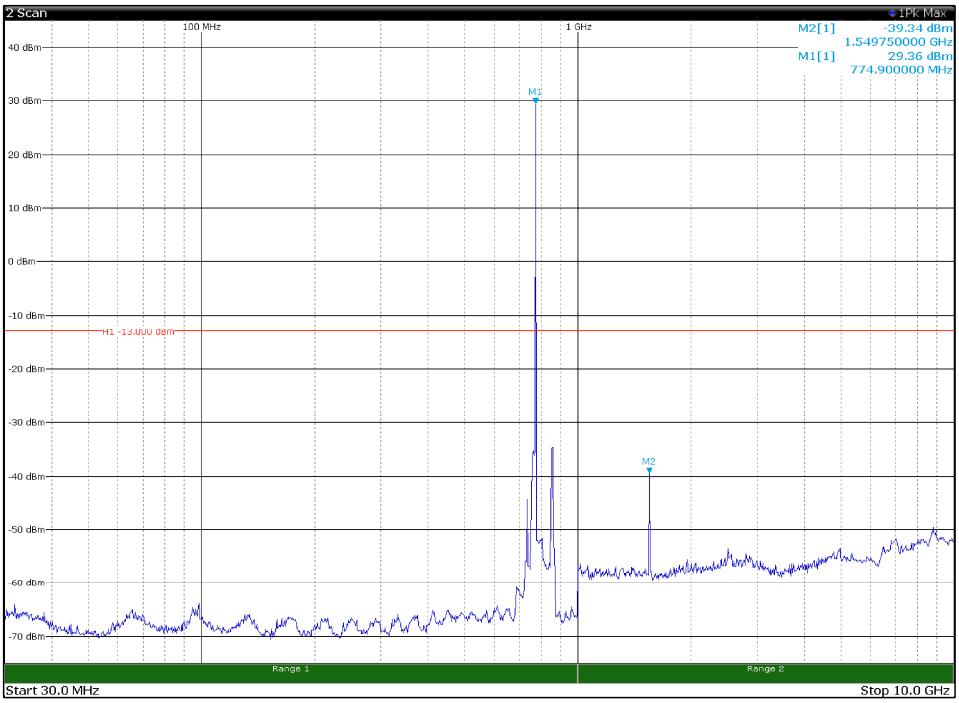
Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 769.1 MHz



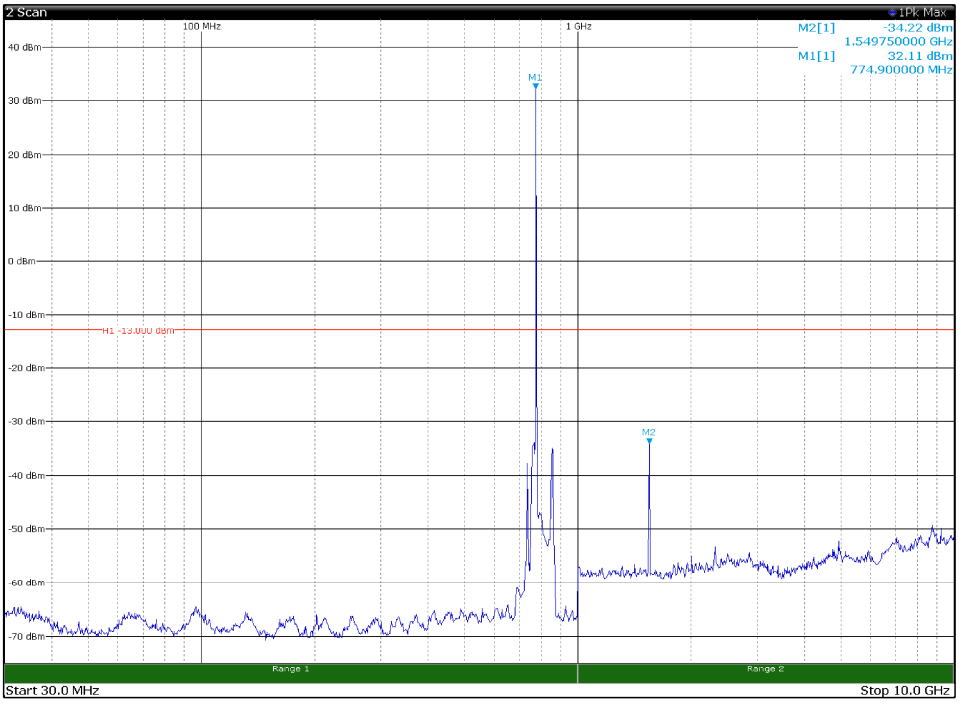
Spurious conducted emissions with input at AGC threshold with CW signal at 772 MHz



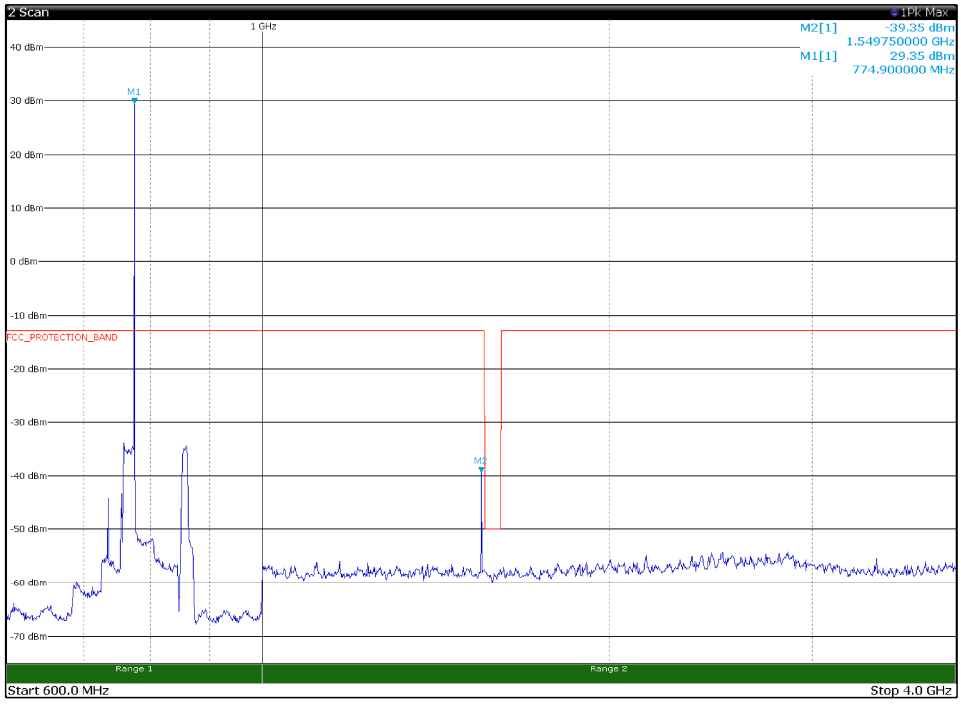
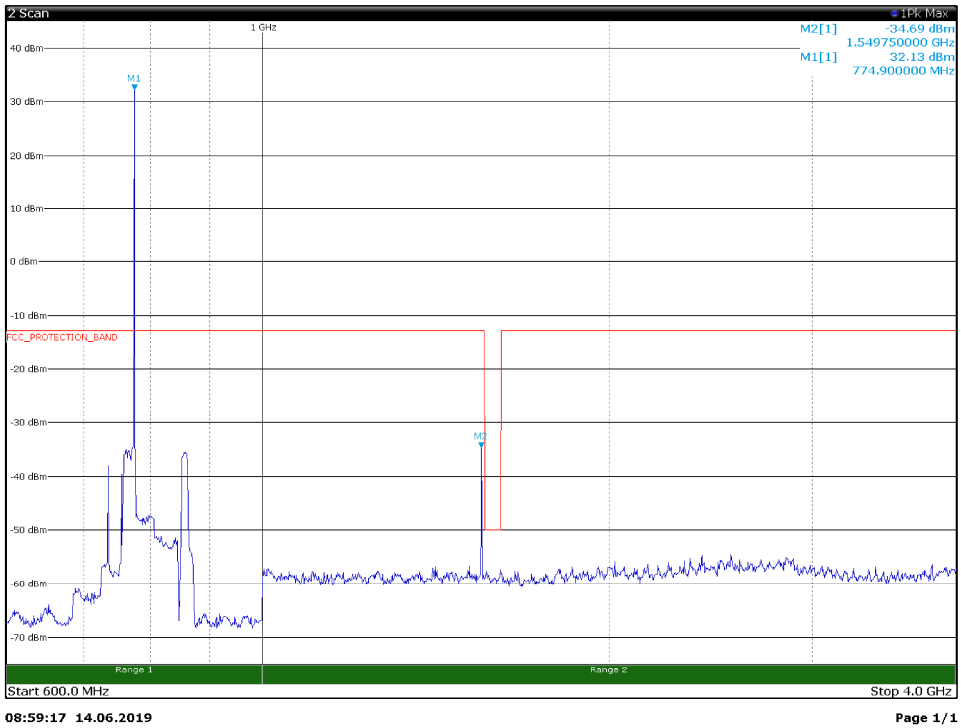
Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 772 MHz



Spurious conducted emissions with input at AGC threshold with CW signal at 774.9 MHz



Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 774.9 MHz

Protection band 1559 MHz – 1610 MHz

Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 774.9 MHz

Spurious conducted emissions with input at AGC threshold with 8K70D1W signal at 774.9 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	[1 2 3]100	100	200
25-50	20	20	50
72-76	5		50
150-174	[5 11]5	[6]5	[4 6]50
216-220	1.0		1.0
220-222[12]	0.1	1.5	1.5
421-512	[7 11 14]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]			

[1]Fixed 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.

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

[3]Travelers 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.

[4]Stations 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.

[5]In 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.

[6]In 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.

[7]In 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.

[8]In 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.
[9]Fixed 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.
[10]Except 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.
[11]Paging 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.
[12]Mobile units may utilize synchronizing signals from associated base stations to achieve the specified carrier stability.
[13]Fixed 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.
[14]Control 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)		
			Mobile Station	
		Base/Fixed	Output Power >2 W	Output Power ≤2 W
406.1-430 and 450-470 [6]	25 [2]	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
+50 °C, Nominal	771.999.426	18	0,02
+40 °C, Nominal	771.999.402	42	0,05
+30 °C, Nominal	771.999.367	77	0,10
+20 °C, +15 %	771.999.452	-8	-0,01
+20 °C, Nominal	771.999.444	***Reference***	***Reference***
+20 °C, –15 %	771999436	8	0,01
+10 °C, Nominal	771.999.420	24	0,03
0 °C, Nominal	771.999.432	12	0,02
–10 °C, Nominal	771.999.390	54	0,07
–20 °C, Nominal	771.999.410	34	0,04
–30 °C, Nominal	771.999.380	64	0,08

6.9 Spurious emissions radiated measurements

FCC 90.543(c)
Out-of-band emission limit. On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

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 5.8.9.2
On any frequency outside of the ranges specified in the ACP tables 13 to 16, the power of any emission shall be attenuated below the mean output power P (dBW) by at least 43 + 10 log10(p), measured in a 100 kHz bandwidth for frequencies less than or equal to 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

In addition, for operations in the bands 768-776 MHz and 798-806 MHz, all emissions (including harmonics in the band 1559-1610 MHz), shall not exceed:
- –70 dBW/MHz equivalent isotropically radiated power (e.i.r.p.) for wideband emissions, and
- –80 dBW/kHz e.i.r.p. for discrete emissions of less than 700 Hz bandwidth.

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

Test results: Pass

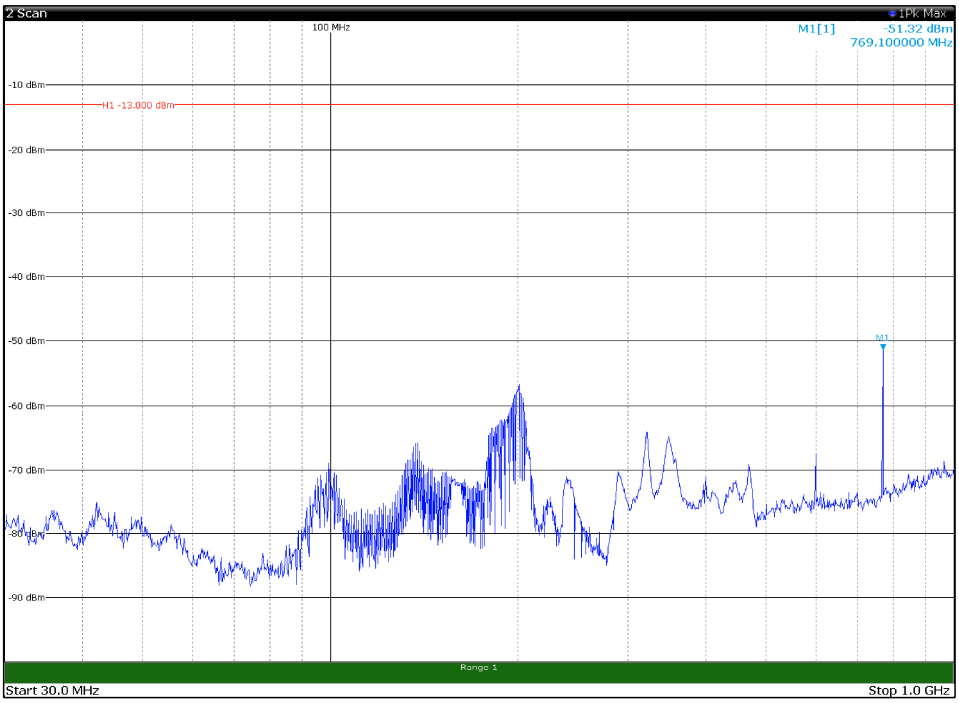
Special notes

Modulation used: CW and 8K70D1W.

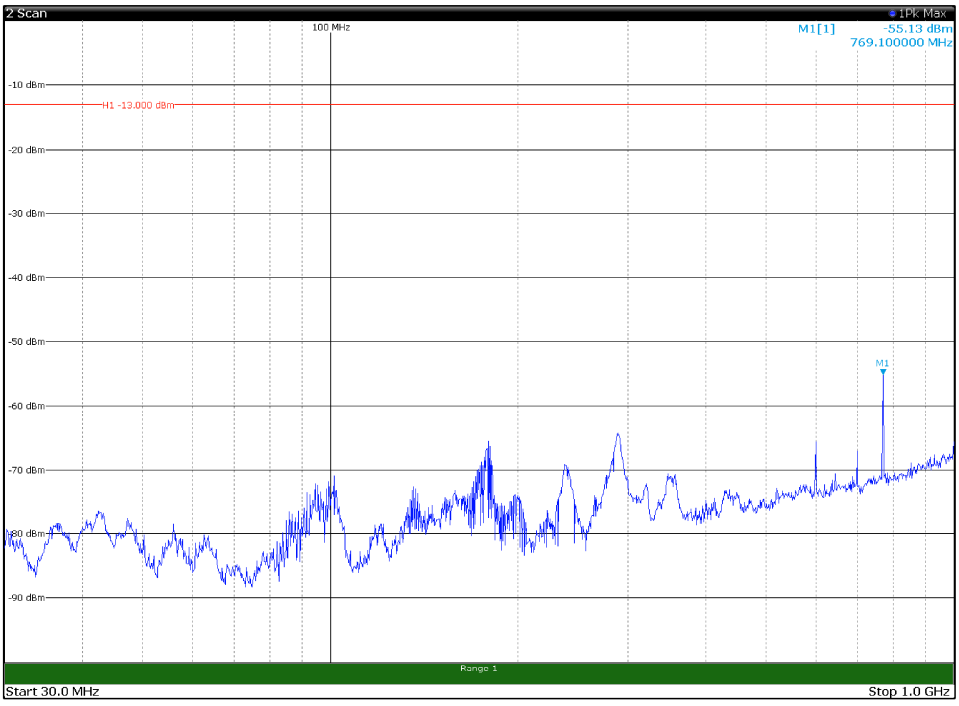
Test data

Spurious radiated emissions 30 MHz to 1 GHz

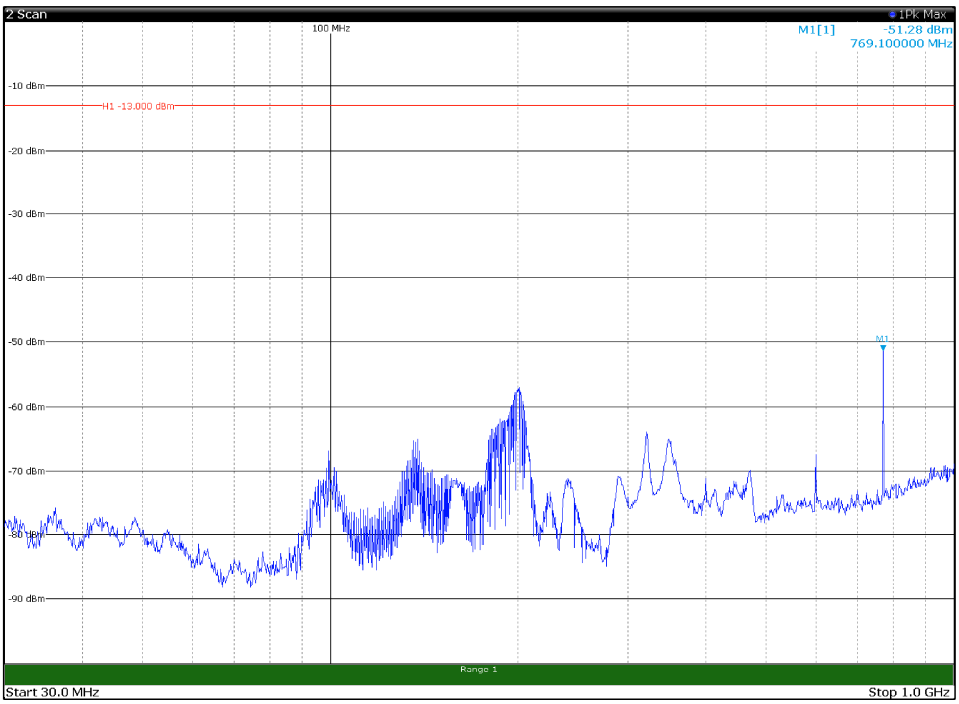
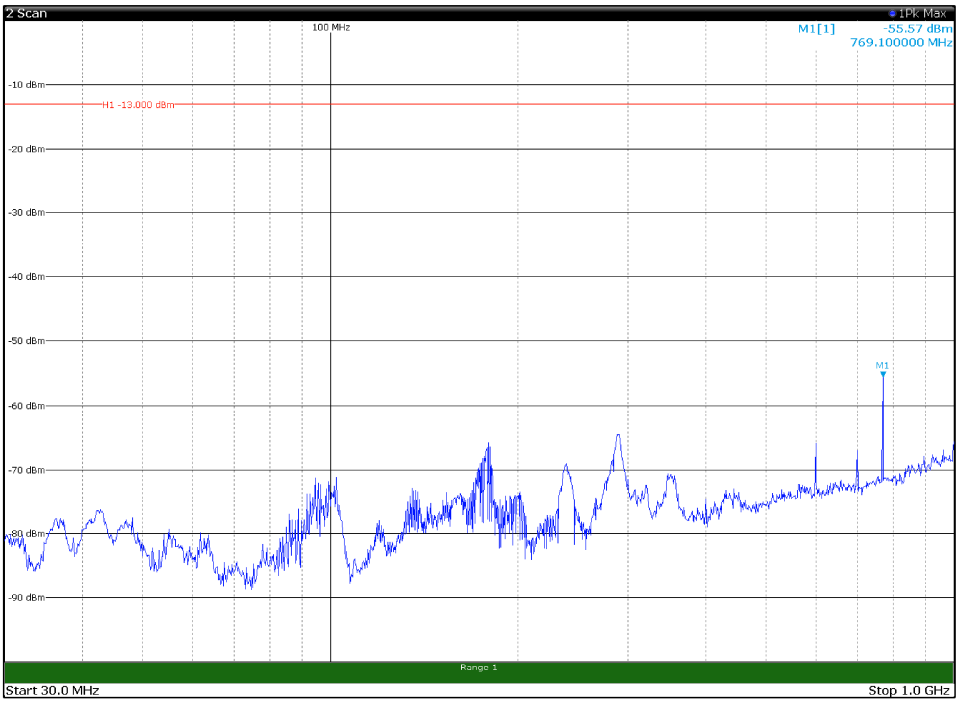
Spurious radiated emissions with input at AGC threshold with CW signal at 769.1 MHz

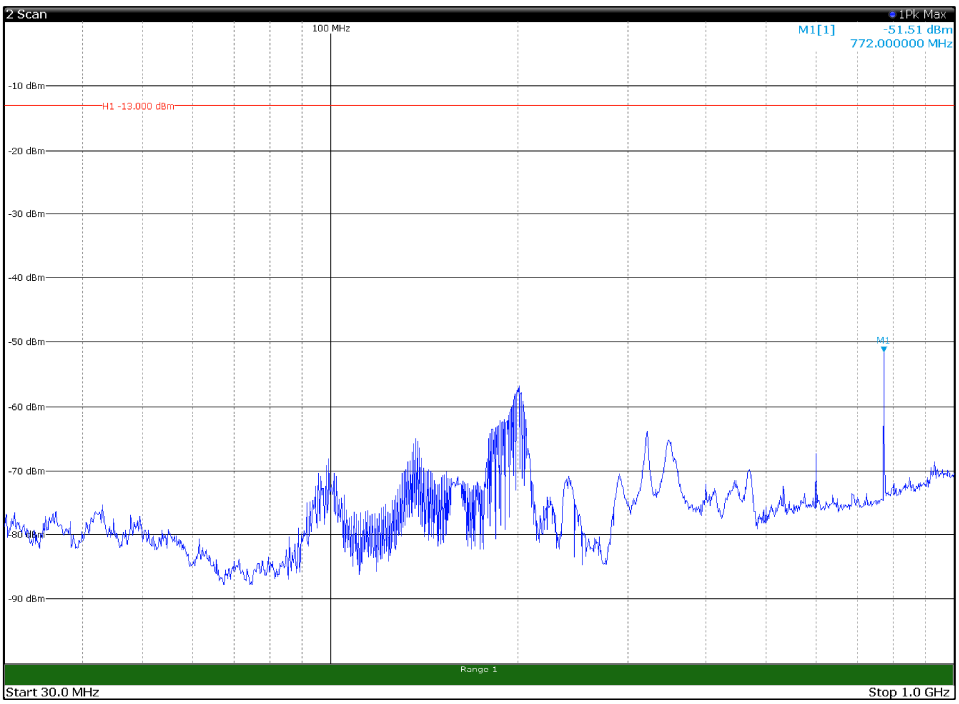
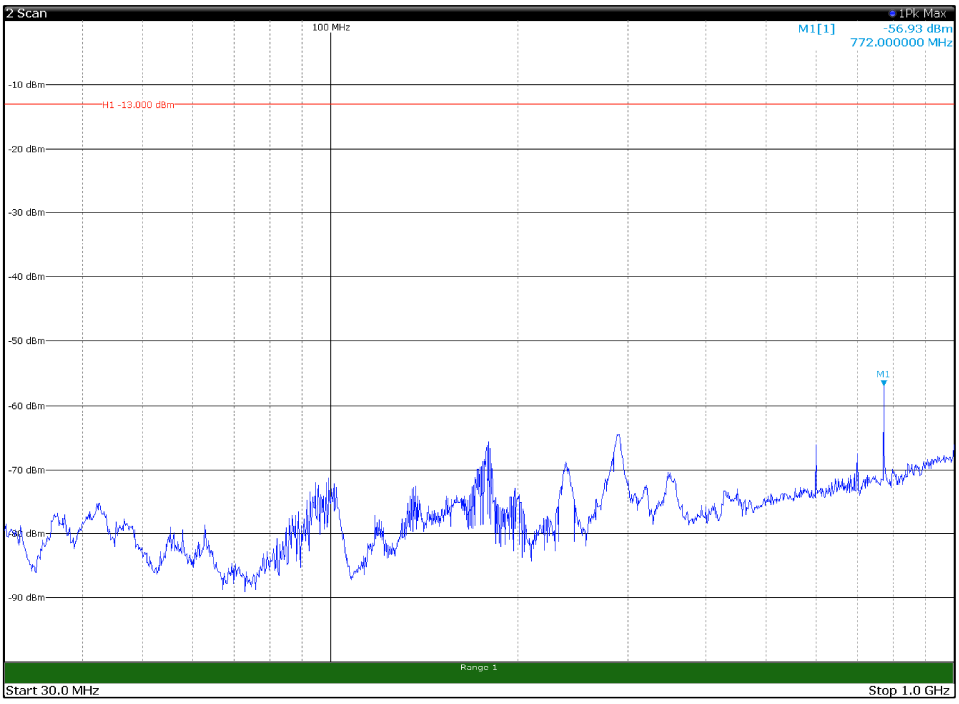


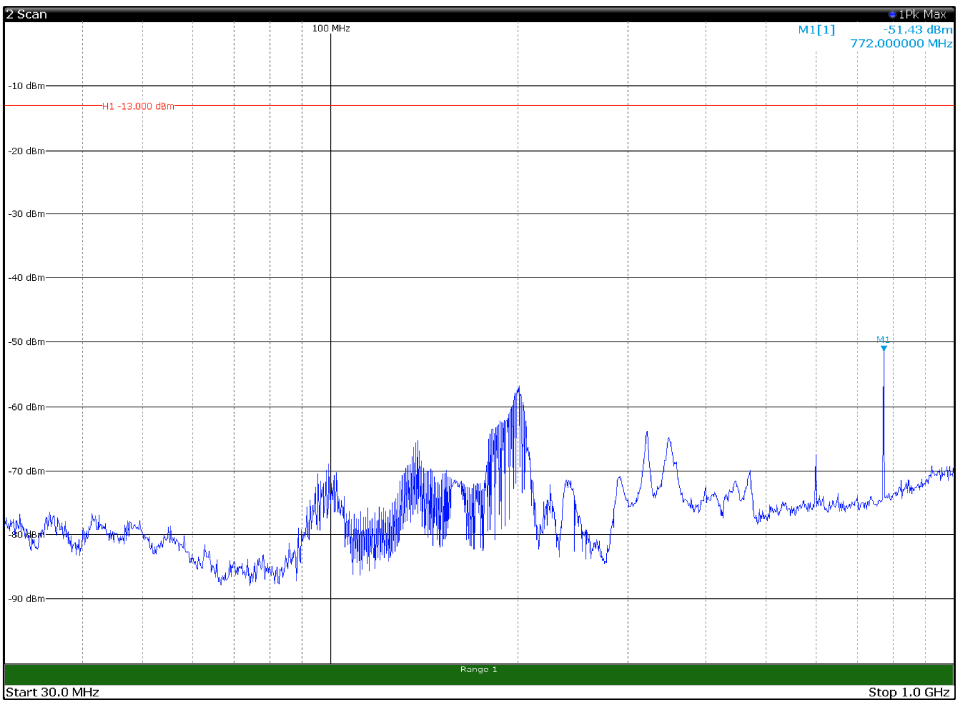
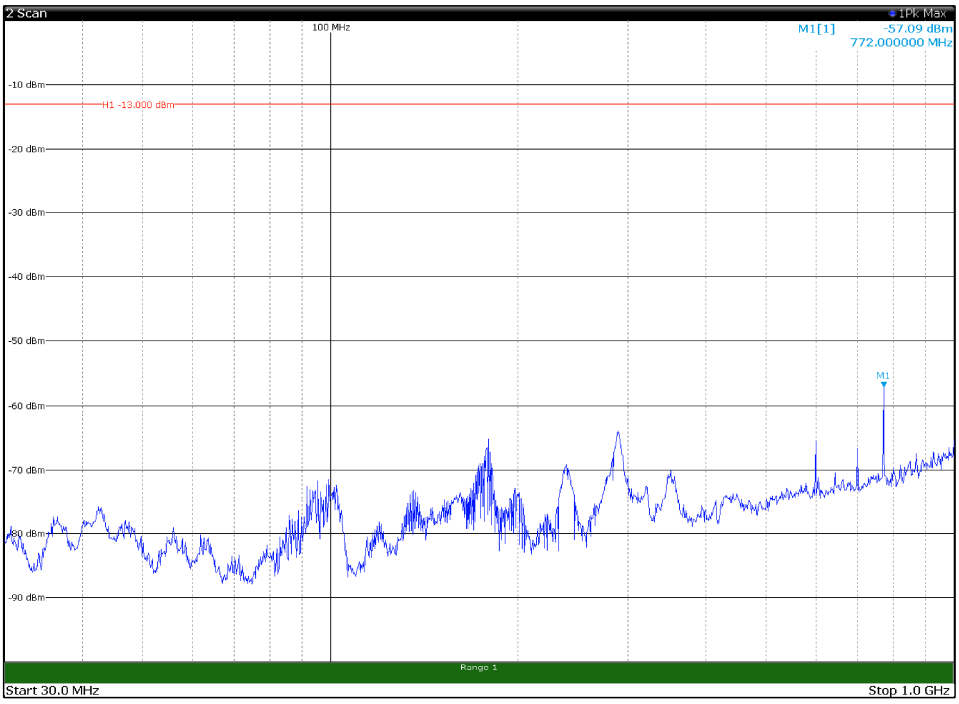
Horizontal polarization

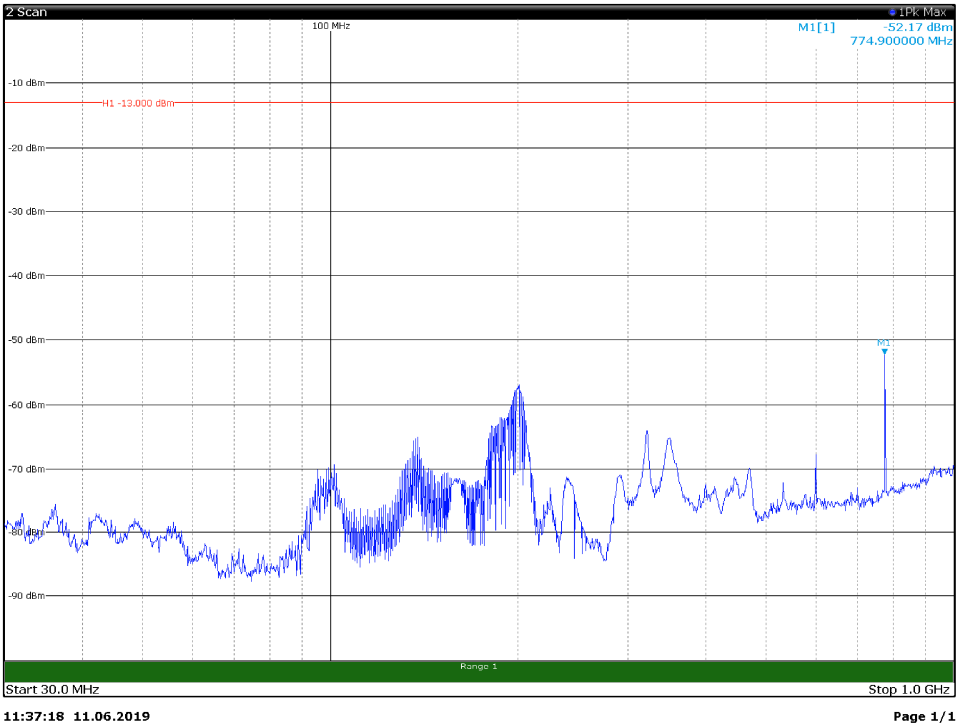
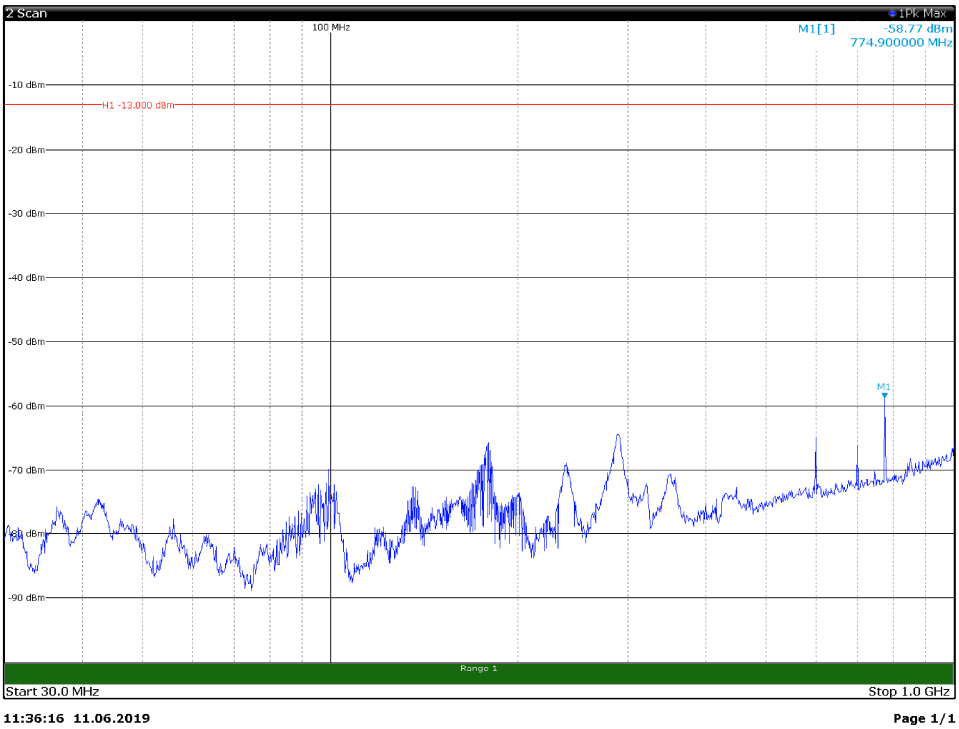


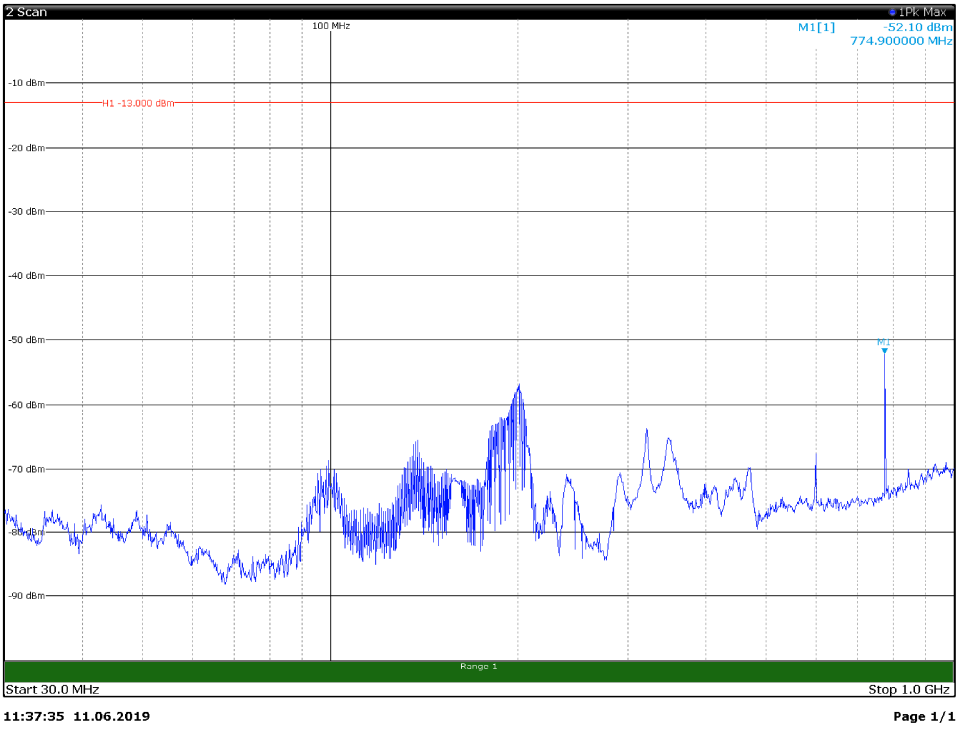
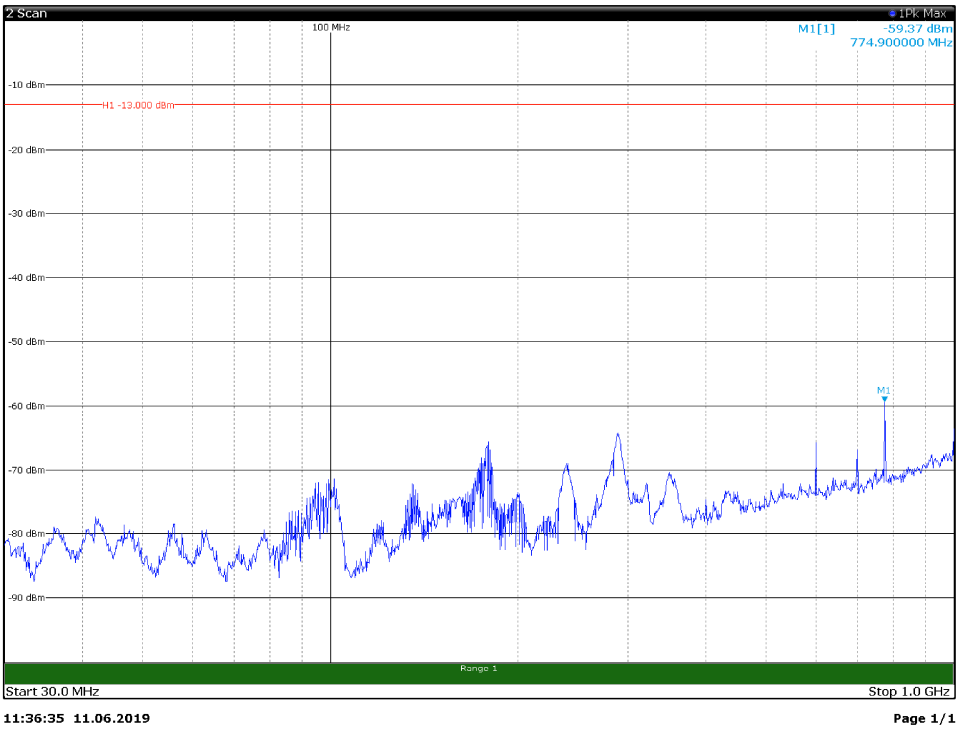
Vertical polarization

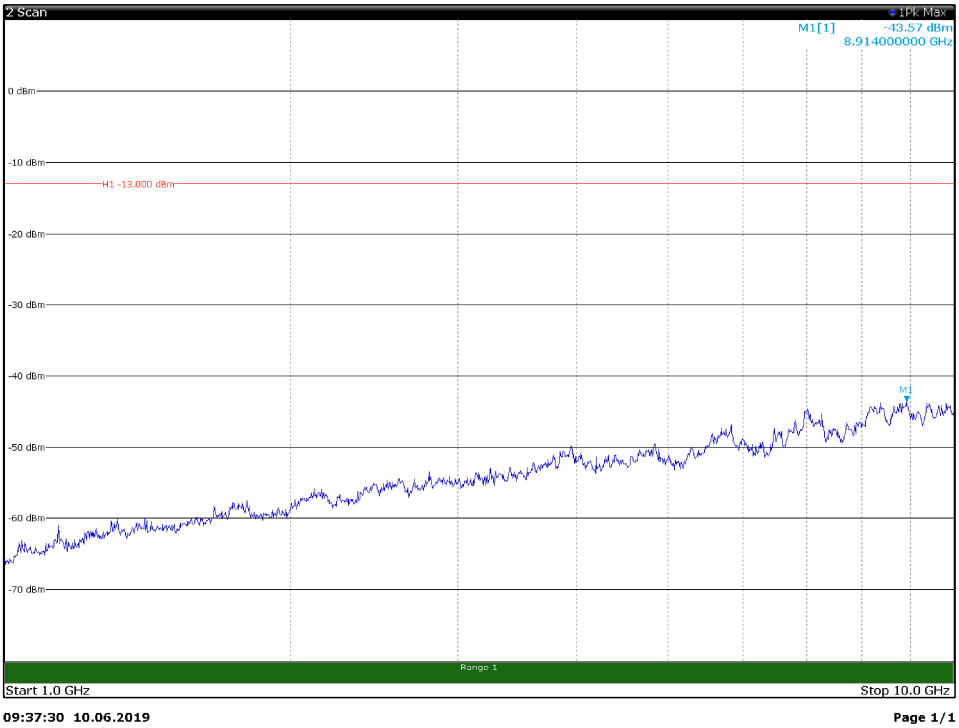
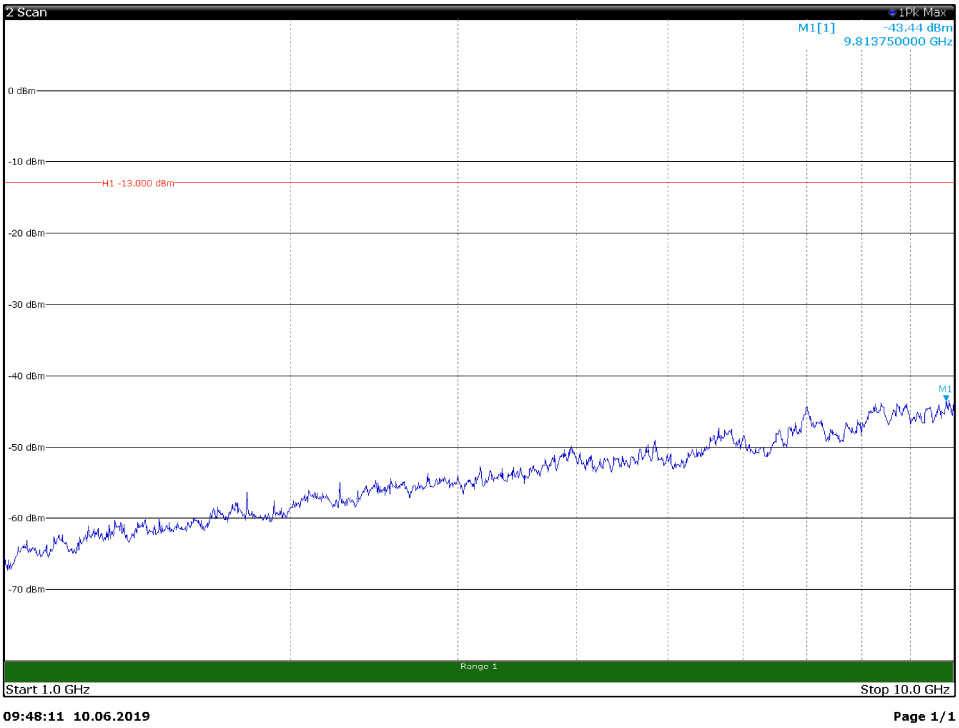
Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 769.1 MHz

Horizontal polarization

Vertical polarization

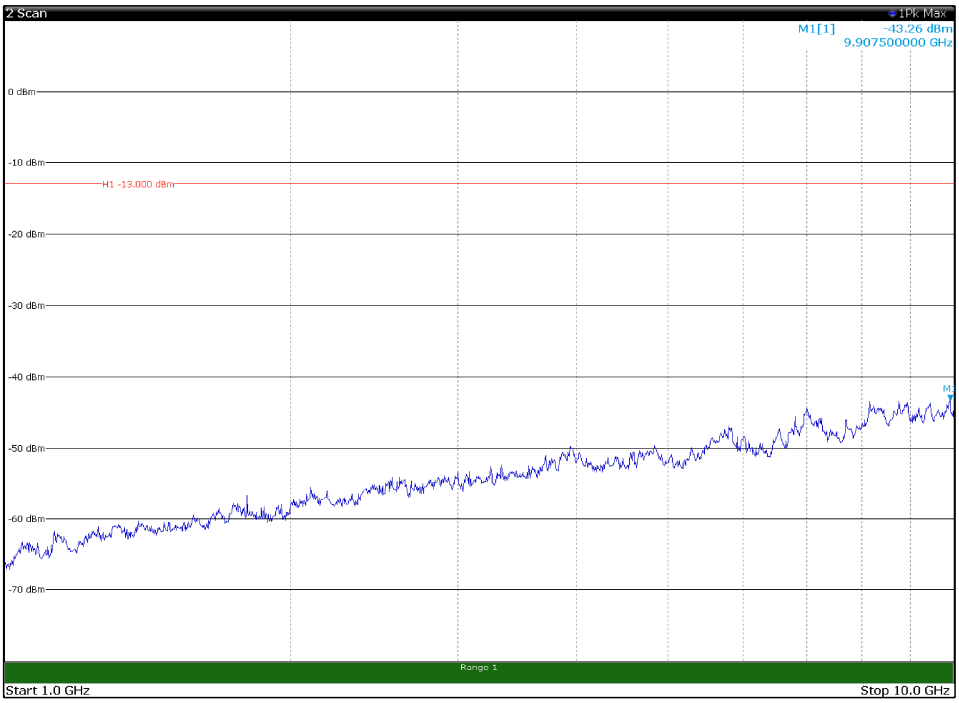
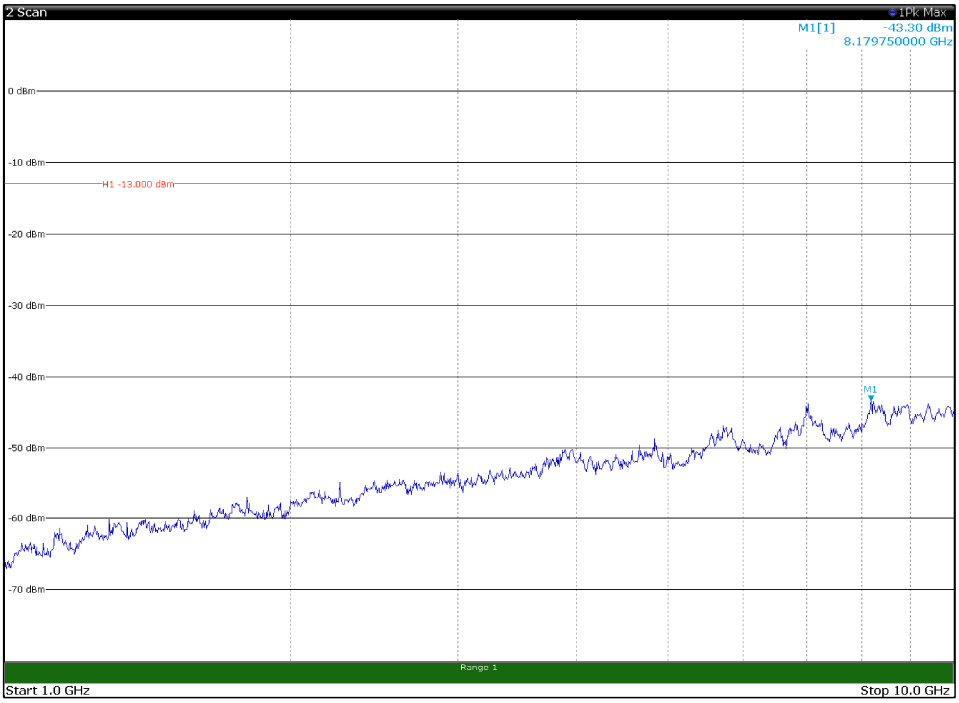
Spurious radiated emissions with input at AGC threshold with CW signal at 772 MHz

Horizontal polarization

Vertical polarization

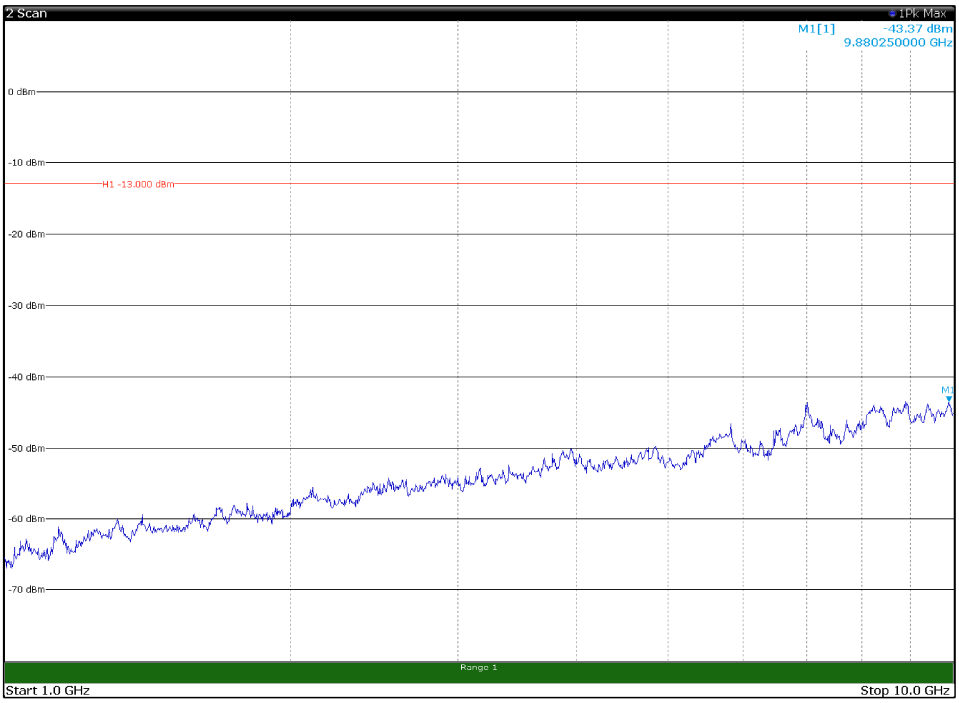
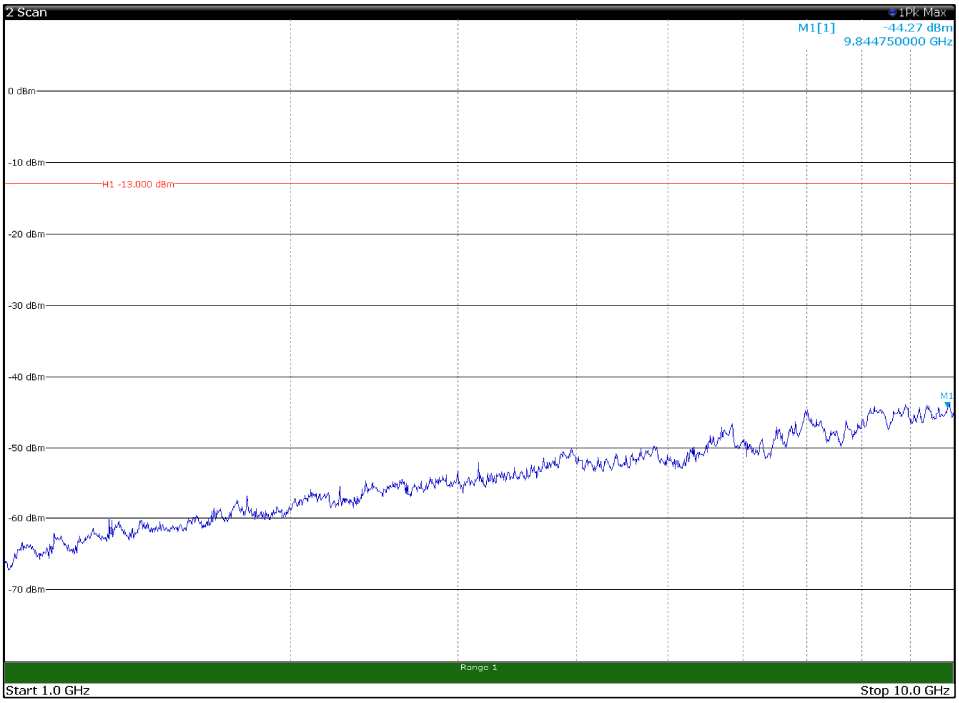
Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 772 MHz

Horizontal polarization

Vertical polarization

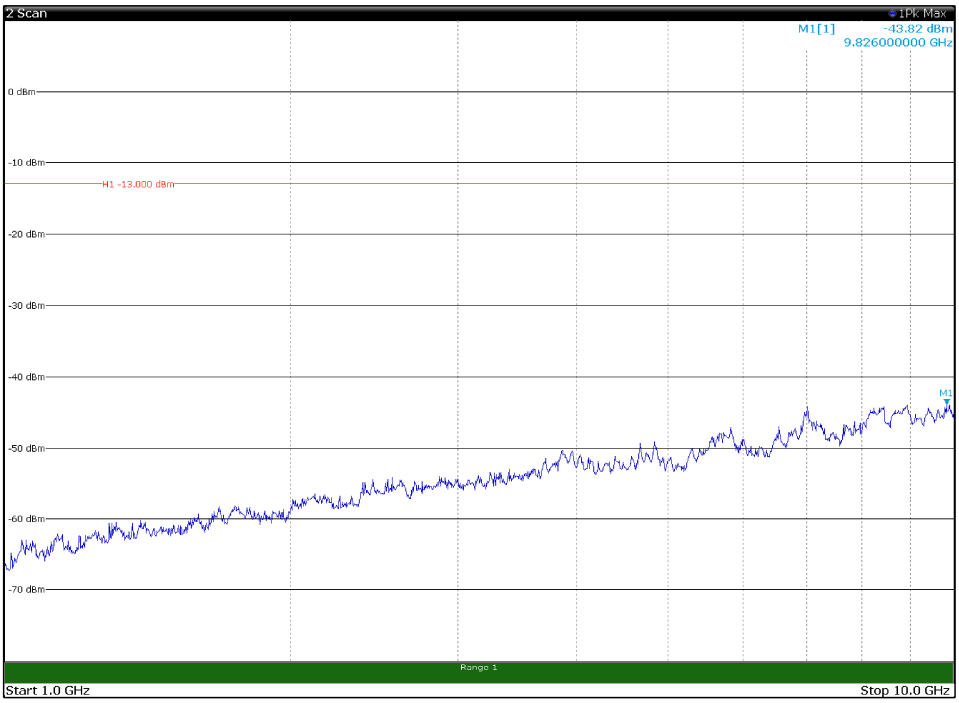
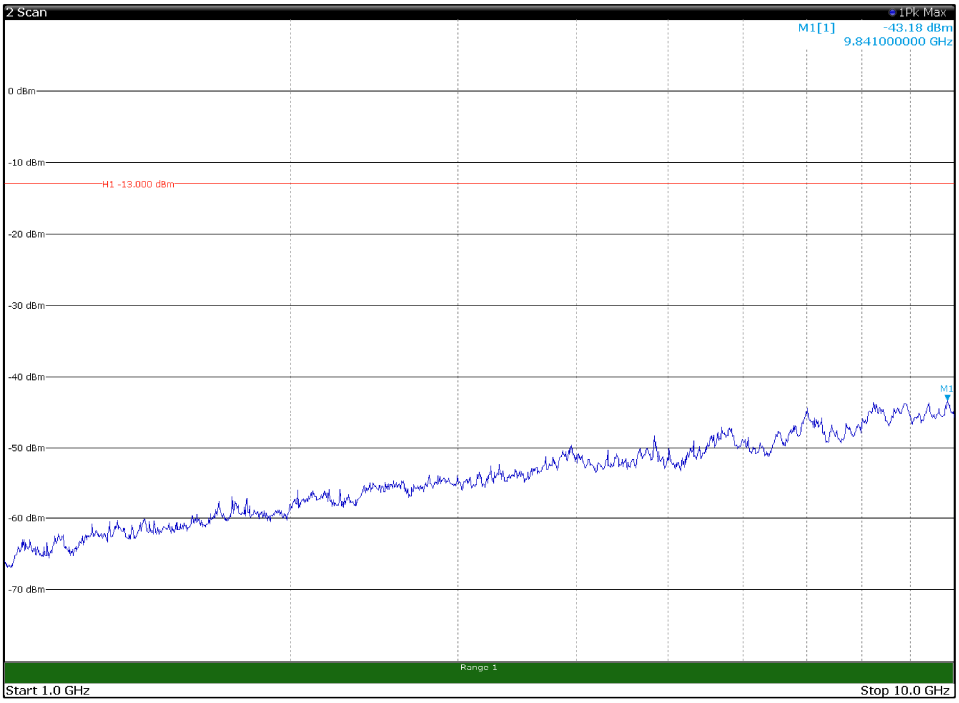
Spurious radiated emissions with input at AGC threshold with CW signal at 774.9 MHz

Horizontal polarization

Vertical polarization

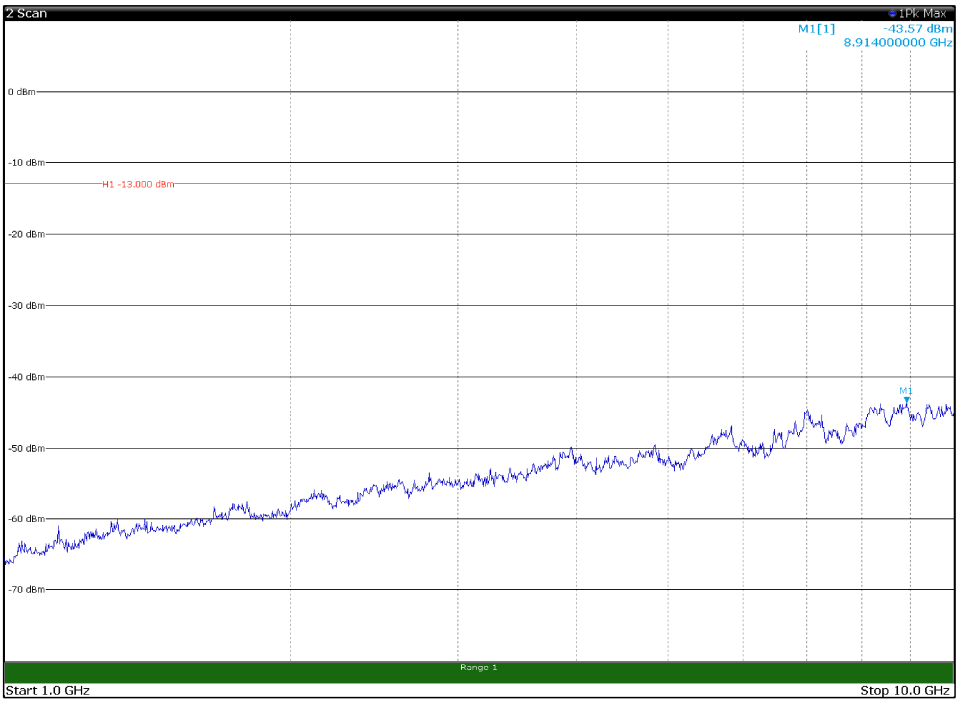
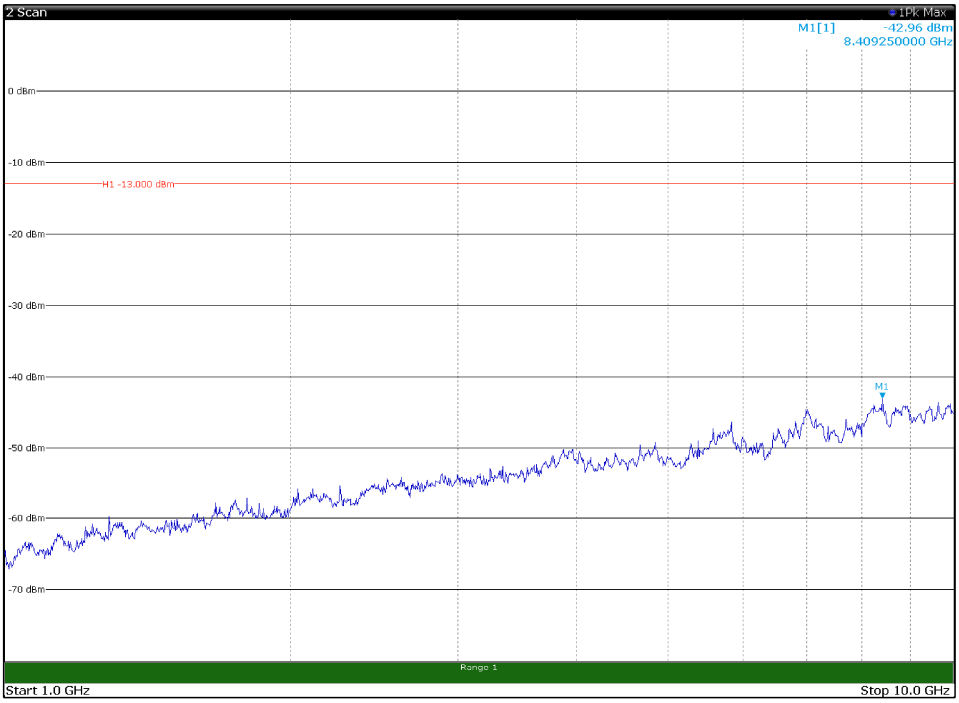
Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 774.9 MHz

Horizontal polarization

Vertical polarization

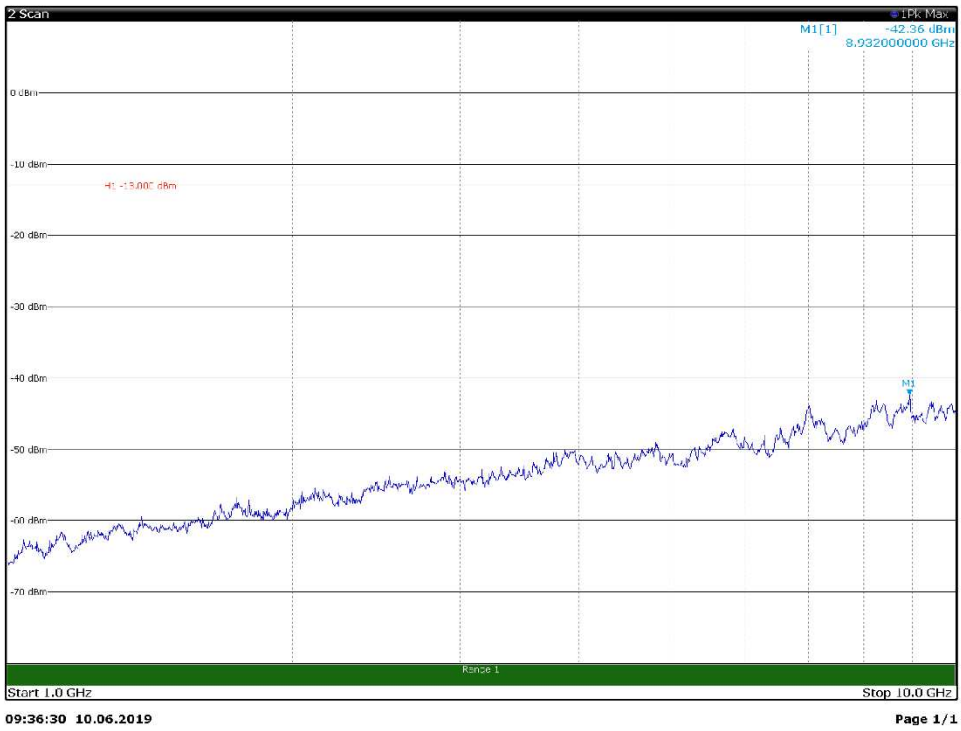
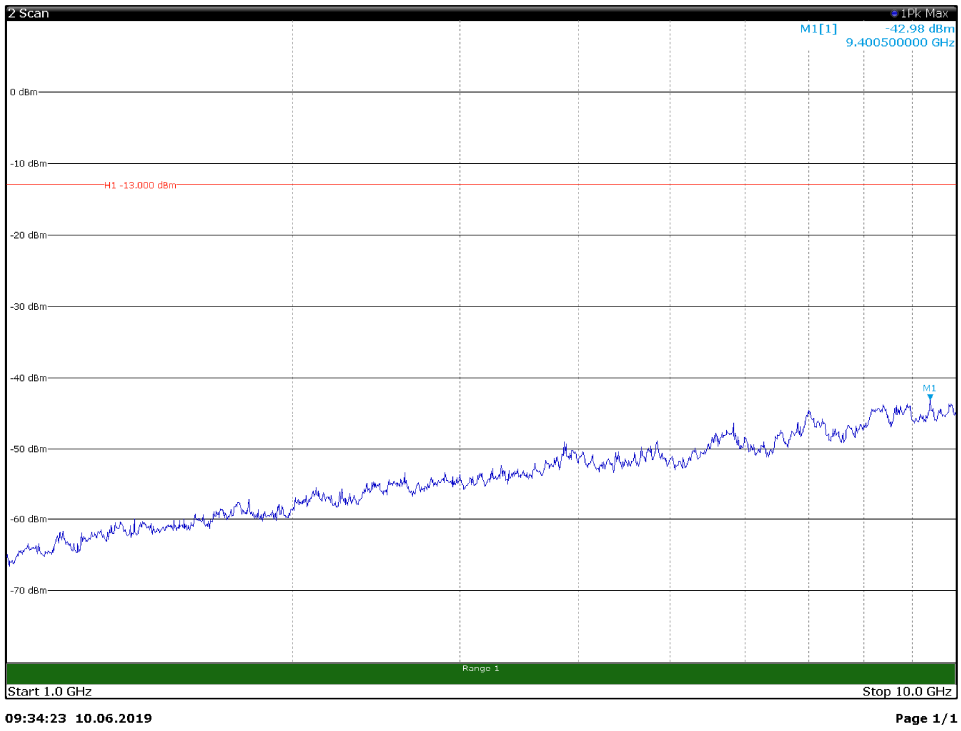
Spurious radiated emissions 1 GHz to 10 GHz
Spurious radiated emissions with input at AGC threshold with CW signal at 769.1 MHz

Horizontal polarization

Vertical polarization

Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 769.1 MHz

Horizontal polarization

Vertical polarization

Spurious radiated emissions with input at AGC threshold with CW signal at 772 MHz

Horizontal polarization

Vertical polarization

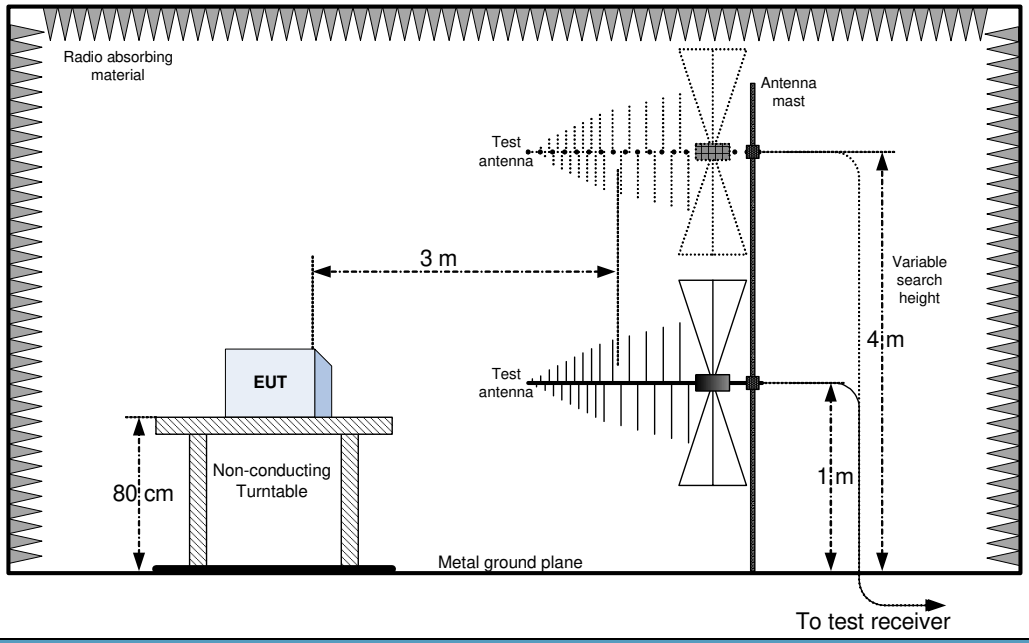
Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 772 MHz

Horizontal polarization

Vertical polarization

Spurious radiated emissions with input at AGC threshold with CW signal at 774.9 MHz

Horizontal polarization

Vertical polarization

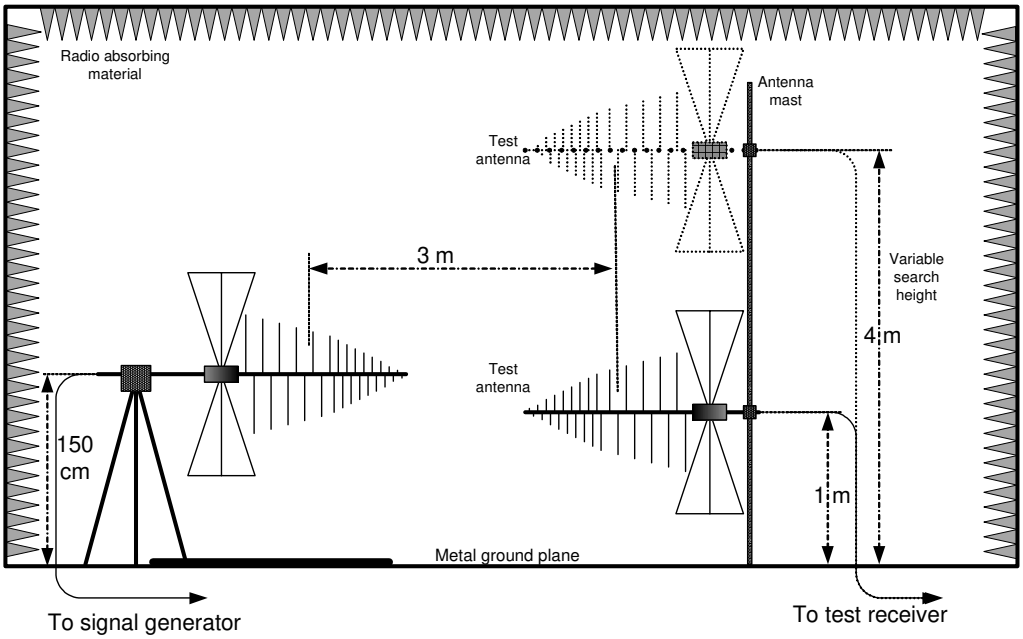
Spurious radiated emissions with input at AGC threshold with 8K70D1W signal at 774.9 MHz

Horizontal polarization

Vertical polarization

Appendix A: Block diagrams of test set-ups

Radiated emissions set-up

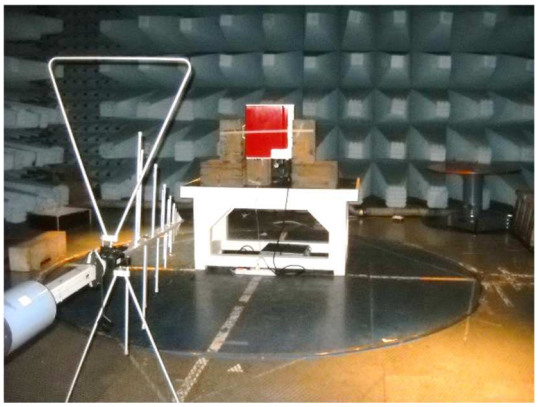


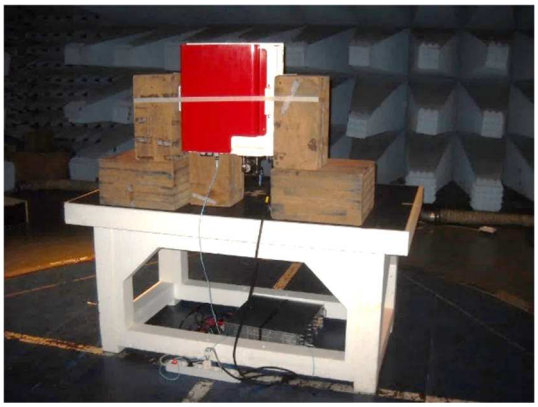
Substitution method set-up

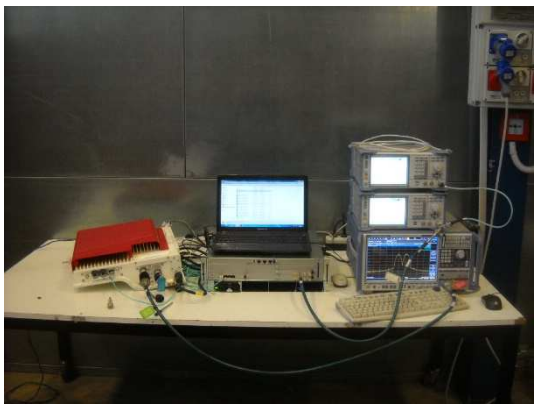


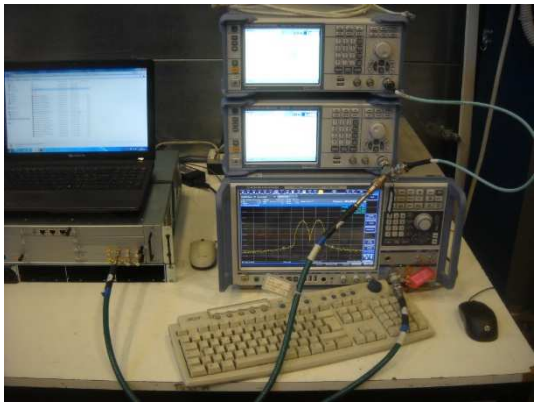
Appendix B: Photos

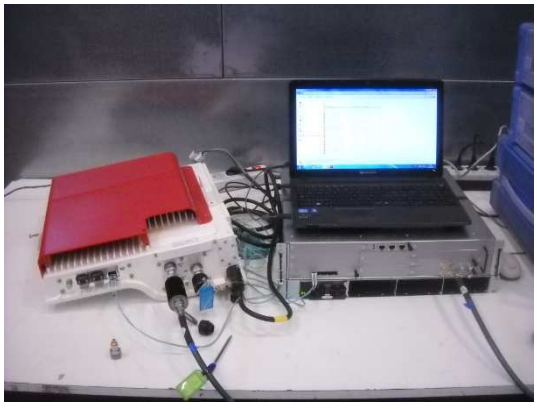
Set-up photos



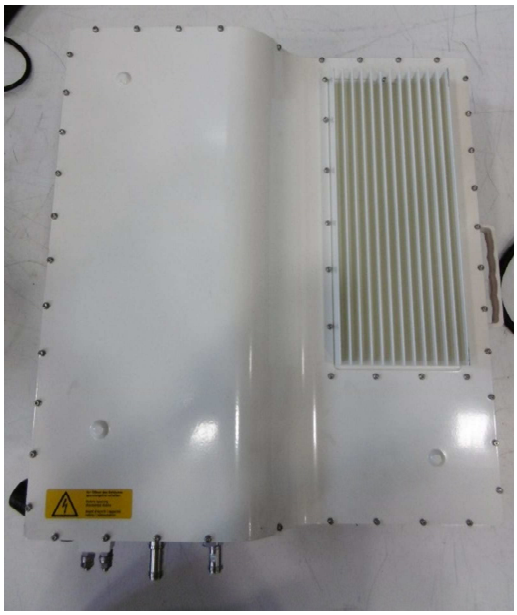








EUT photos



End of report