



Report Reference ID:	382048-3TRFWL
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Test specification:	Title 47 – Telecommunication Chapter I – Federal Communications Commission Part 90 – Private land mobile radio services RSS-131 Issue 3 Zone Enhancers RSS-140 Issue 1 Equipment Operating in the Public Safety Broadband Frequency Bands 758-768 MHz and 788-798 MHz
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Applicant:	Andrew Wireless Systems Industriering, 10 – 86675 Buchdorf – Germany
Apparatus:	Carrier Access Point
Model:	CAP M 6/6/7E/7E F – AC CAP M 6/6/7E/7E F – DC
FCC ID:	XS5-CAPM667E7E
IC Registration Number:	2237E-CAPM667E7E

Testing laboratory:	Nemko Spa Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
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	Name, function and signature	Date
Tested by:	Tessa S.  (project handler)	2019-11-26
Reviewed by:	Barbieri P.  (verifier)	2019-11-26

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Section 1: Report summary

1.1 Test specification

Specifications	<p>Part 90 – Private land mobile radio services</p> <p>RSS-131 Issue 3 – Zone Enhancers for the Land Mobile Service</p> <p>RSS-140 Issue 1 Equipment Operating in the Public Safety Broadband Frequency Bands 758-768 MHz and 788-798 MHz</p>
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1.2 Statement of compliance

Compliance	<p>In the configuration tested the EUT was found compliant Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>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-140 Issue 1. The tests were conducted in accordance with ANSI C63.26-2015 and KDB 935210 D05 Indus Booster Basic Meas v01r03 and KDB 662911 D01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.</p>
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1.3 Exclusions

Exclusions	None
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1.4 Registration number

Test site:	FCC ID number 682159 (10 m Semi anechoic chamber) ISED ID number 9109A
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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
90.542(a) 90.219(e)(1)	935210 D05v01r03 Clause 4.5 662911 D01	Input/output power and amplifier/booster gain	Pass
90.219(e)(2)	935210 D05v01r03 Clause 4.6	Noise figure measurements	Pass
90.219(e)(3) 90.543(e)(1)(3)	935210 D05v01r03 Clause 4.7.2 662911 D01	Out-of-band/out-of-block emissions conducted measurements	Pass
90.543(e)(1)(3) 90.543(f)	935210 D05v01r03 Clause 4.7.3 662911 D01	EUT spurious emissions conducted measurements	Pass
90.539(d)	935210 D05v01r03 Clause 4.8	Frequency stability measurements	Pass
90.543(e)(1)(3)	935210 D05v01r03 Clause 4.9	Spurious emissions radiated measurements	Pass

Notes:

2.2 RSS-131 and RSS-140, test results

Part	Methods	Test description	Verdict
--	935210 D05v01r03 Clause 4.2	AGC threshold	Pass
RSS-131 §5.2.1	935210 D05v01r03 Clause 4.3	Out of band rejection	Pass
RSS-131 §5.2.2	935210 D05v01r03 Clause 4.4	Input-versus-output signal comparison	Pass
RSS-131 §5.2.3 RSS-140 §4.3	935210 D05v01r03 Clause 4.5 662911 D01	Input/output power and amplifier/booster gain	Pass
--	935210 D05v01r03 Clause 4.5	Noise figure measurements	Pass
RSS-140 §4.4 (a)(b)	935210 D05v01r03 Clause 4.7.2 662911 D01	Out-of-band/out-of-block emissions conducted measurements	Pass
RSS-140 §4.4 (a)(b)	935210 D05v01r03 Clause 4.7.3 662911 D01	EUT spurious emissions conducted measurements	Pass
RSS-131 §5.2.4 RSS-140 §4.2	935210 D05v01r03 Clause 4.8	Frequency stability measurements	Pass
RSS-140 §4.4 (a)(b)	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 <input type="checkbox"/> No <input checked="" type="checkbox"/>
b) Limited single modular approval	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

3.3 Product details

FCC ID	Grantee code:	XS5
	Product code:	-CAPM667E7E
IC ID	Proposed certification number:	2237E-CAPM667E7E
Equipment class	B9B	
Description of product as it is marketed	Carrier Access Point	
	Model name:	CAP M 6/6/7E/7E F – AC CAP M 6/6/7E/7E F – DC
	Serial number:	AC Model: TEST 9 DC Model: TEST 10
Product	The EUT is also classified as Terminal Equipment subject to IC CS-03 No <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Network interface type: Ringer equivalence number: Single line equipment: No <input type="checkbox"/> Yes <input type="checkbox"/> Terminal equipment category:	

3.4 Application purpose	
Type of application	<input checked="" type="checkbox"/> Original certification <input type="checkbox"/> Change in identification of presently authorized equipment <input type="checkbox"/> Original FCC ID: _____ Grant date: _____ <input type="checkbox"/> Class II permissive change or modification of presently authorized equipment

3.5 Certification details	
Services requested Type of assessment	<input checked="" type="checkbox"/> New certification <input type="checkbox"/> New family <input type="checkbox"/> Re-assessment <input type="checkbox"/> Existing family <input type="checkbox"/> Multiple listing

3.6 Composite/related equipment	
a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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 <input type="checkbox"/> No <input checked="" type="checkbox"/>
c) Related FCC ID	If either of the above is "yes": <input type="checkbox"/> has been granted under the FCC ID(s) listed below: <input type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below: <input type="checkbox"/> is pending with the FCC ID(s) listed below: <input type="checkbox"/> has a mix of pending and granted statuses under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.7 Sample information	
Receipt date:	2019-11-11
Nemko sample ID:	382048-1/2

3.8 EUT technical specifications	
Operating band:	758 – 768 MHz
Operating frequency:	Wideband
Occupied bandwidth:	4.18 MHz
Channel spacing:	Standard
Emission designator:	W7D, W7E
RF Output	Down Link: 32.7 dBm Up Link: The EUT does not transmit over the air in the up-link direction
Gain	Down Link: 27.9 dBm 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:	48 V DC

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:	SZBEAP1924A0002 and SZBEAP1919A0036
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:	7663610-00
Serial number:	PSU12V_1_0_1
Connection port:	DC
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.
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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 2.8.0.155 (SW is preloaded into ERA systems and to setup the system it’s required a connection through LAN and access to html setup page).
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Section 4: Engineering considerations

4.1 Modifications incorporated in the EUT

Modifications	Modifications performed to the EUT during this assessment None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> , performed by Client <input type="checkbox"/> or Nemko <input type="checkbox"/> Details:
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4.2 Deviations from laboratory tests procedures

Deviations	Deviations from laboratory test procedures None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> - details are listed below:
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4.3 Technical judgment

Judgment	None
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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	<p>Unless different values are declared in the test case, following ambient conditions apply for the tests:</p> <p>Temperature: 18 ÷ 33 °C Relative humidity: 30 ÷ 60 % Air pressure: 980 ÷ 1060 hPa</p> <p>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.</p>
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	Testo	Severis 2	1892

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)
	Conducted	Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
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	2019-09	2020-09
EMI receiver (9 kHz ÷ 3 GHz)	Rohde & Schwarz	ESCI	100888	2019-10	2020-10
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	2019-01	2020-01
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	2019-08	2020-08
Signal generator	Rohde & Schwarz	SMBV100A	263397	2019-10	2020-10
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.

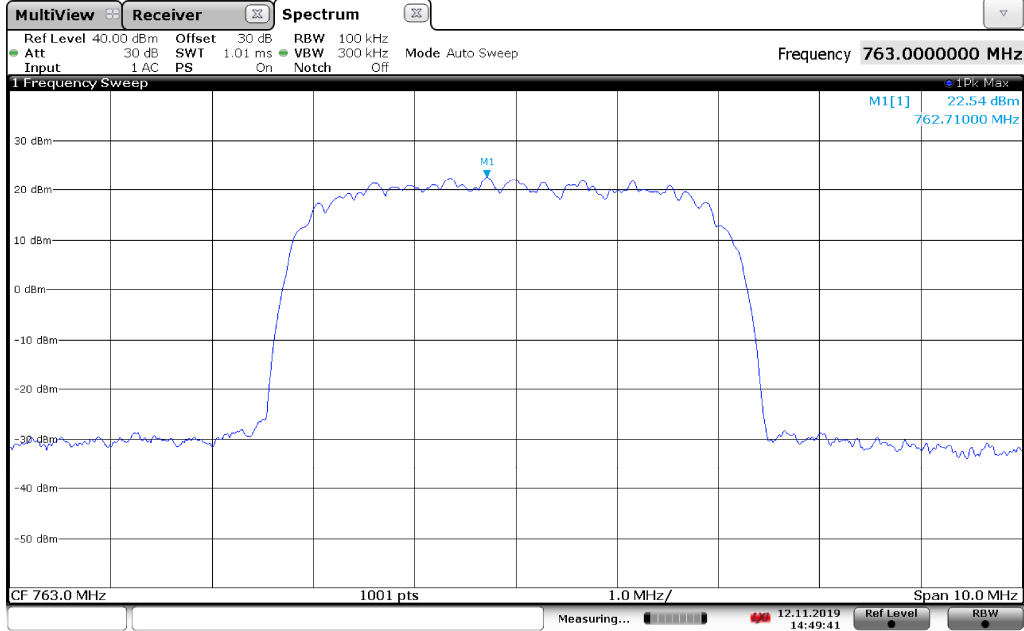
Test date: 2019-11-11

Test results: Pass

Special notes

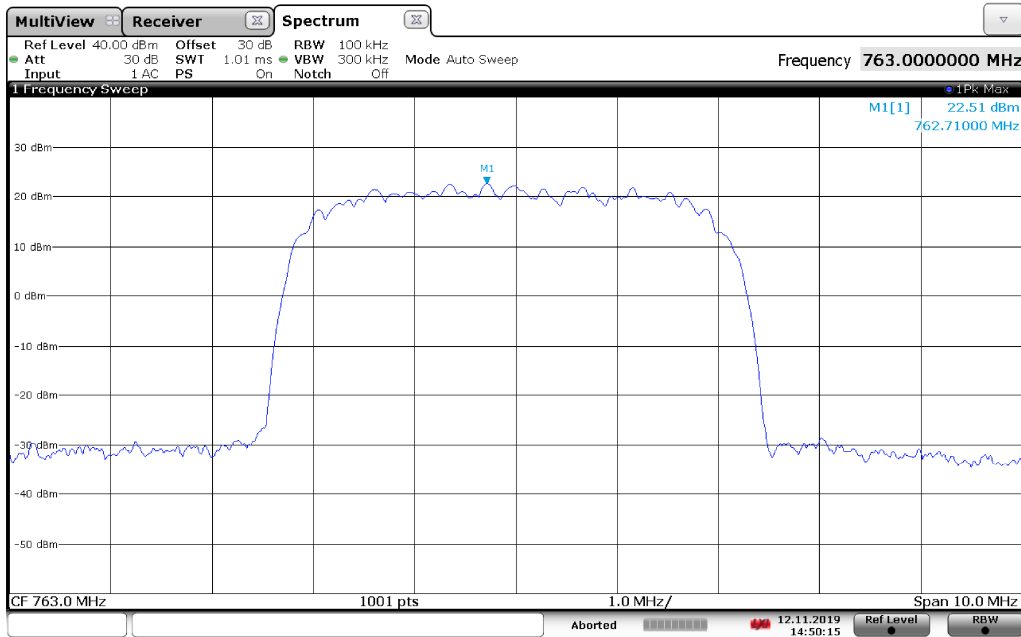
Signal stimulation: AWGN5
 Offset: 33 dB due to 30 dB physical attenuator

Test data



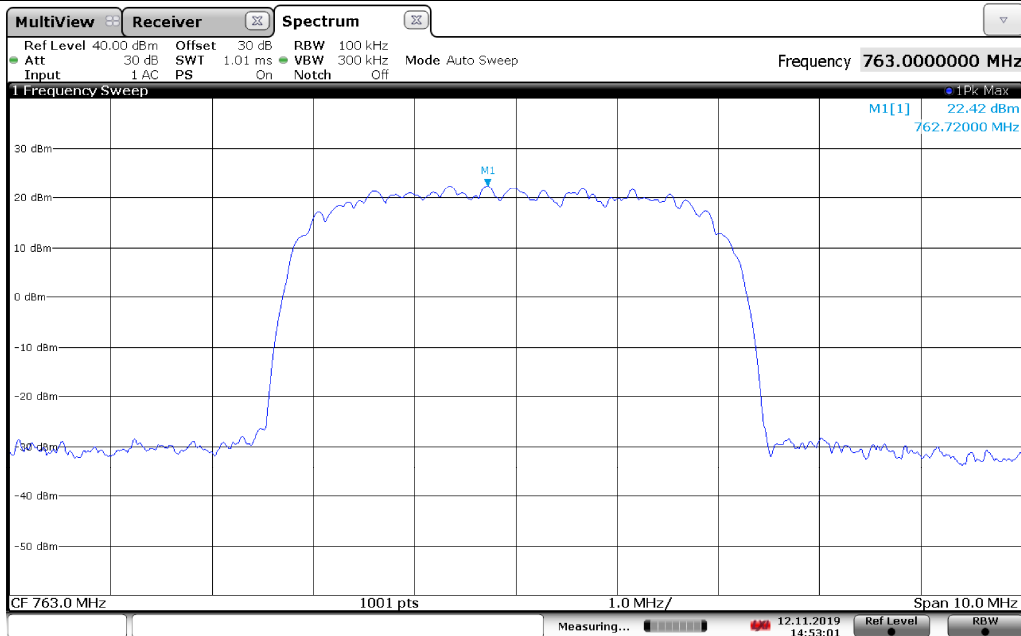
Output spectral plot with input at AGC threshold with AWGN5 signal at 763 MHz, Antenna 1

Test data

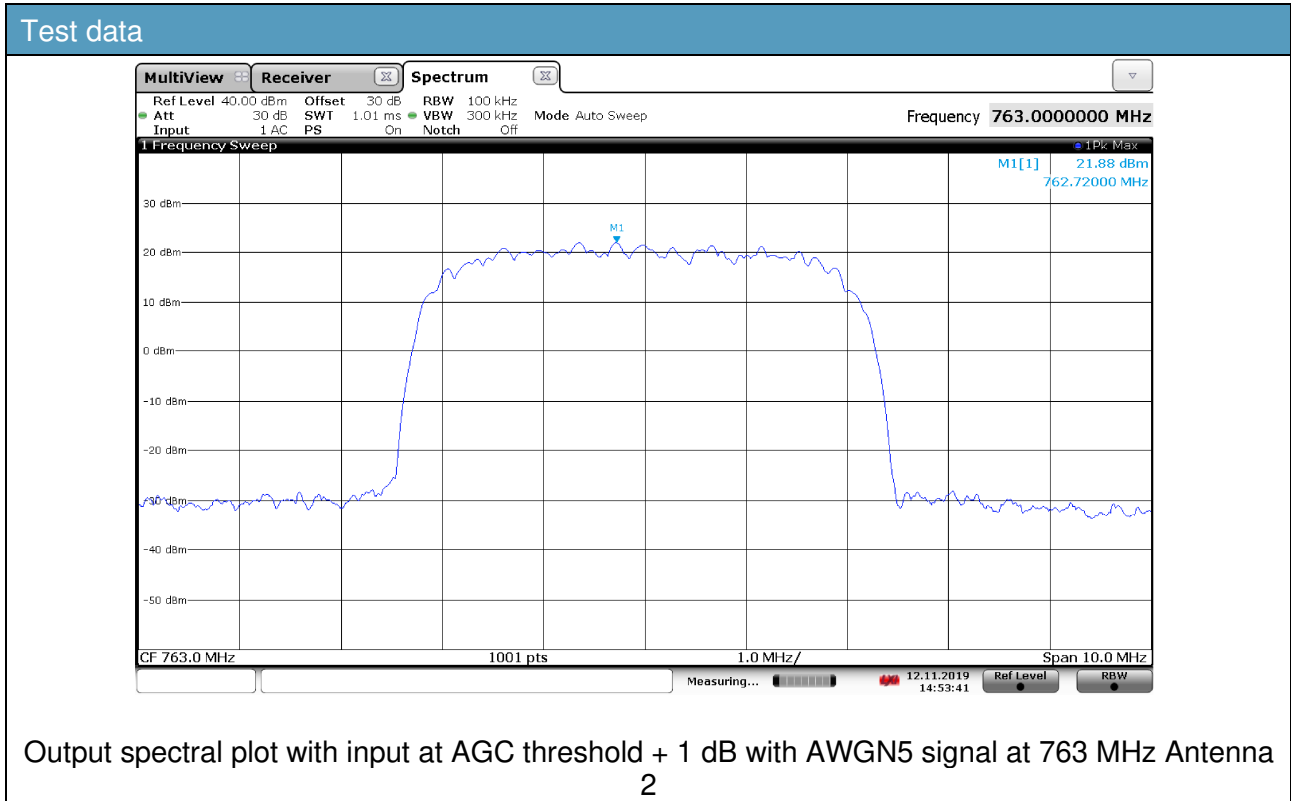


Output spectral plot with input at AGC threshold +1 dB with AWGN5 signal at 763 MHz, Antenna 1

Test data



Output spectral plot with input at AGC threshold with AWGN5 signal at 763 MHz Antenna 2



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.

RSS-131 clause 5.2.1

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.

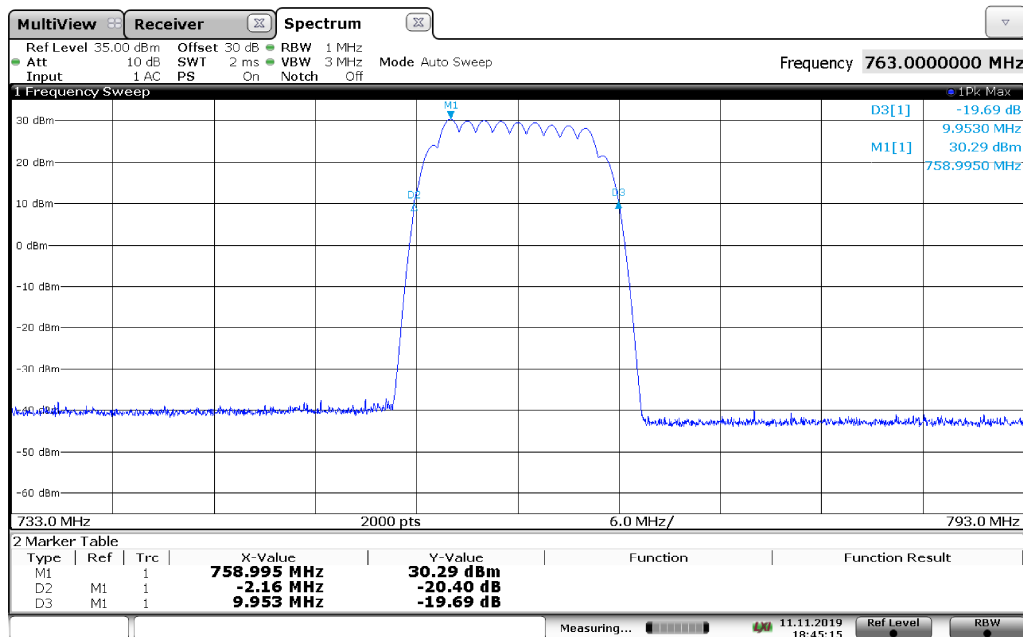
Test date: 2019-11-11

Test results: Pass

Special notes

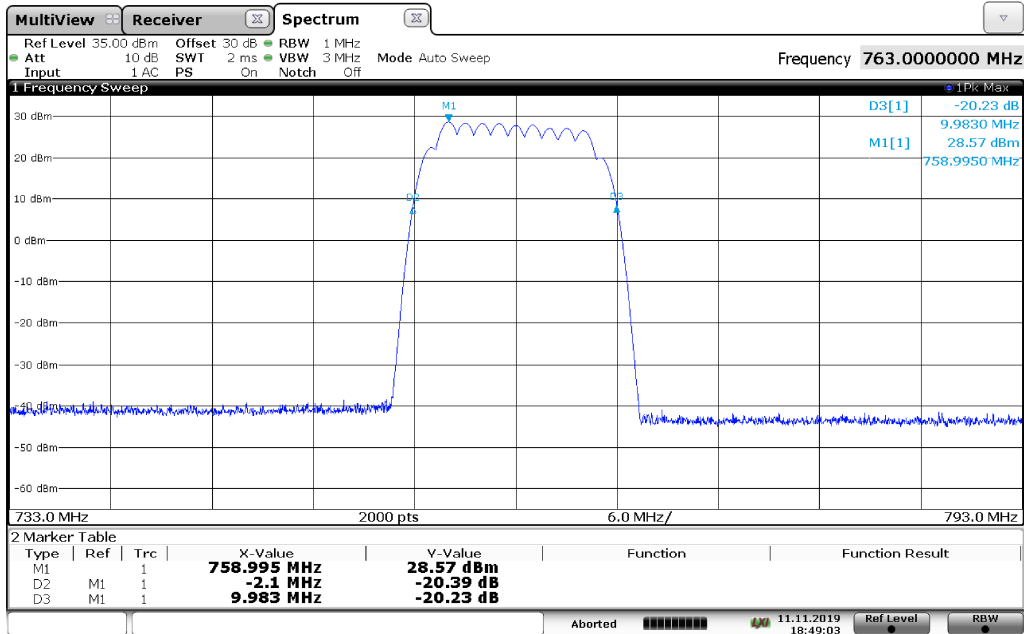
Signal stimulation: CW
Offset: 33 dB due to 30 dB physical attenuator

Test data



Antenna 1

Test data



Antenna 2

6.3 Input-versus-output signal comparison

RSS-131 clause 5.2.2

The spectral growth of the 26 dB bandwidth of the output signal shall be less than 5% of the input signal spectrum.

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).

Test date: 2019-11-11

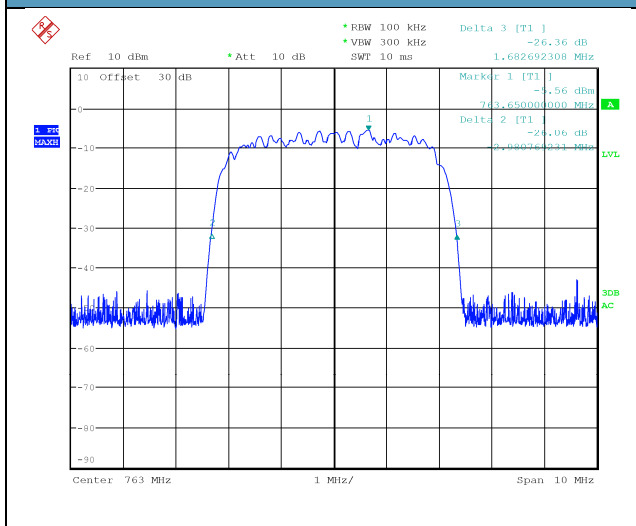
Test results: Pass

Special notes

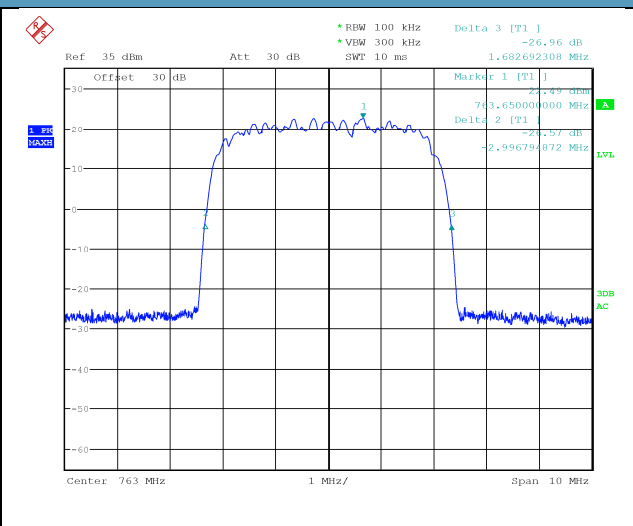
Signal stimulation: AWGN5

Offset: 33 dB due to 30 dB physical attenuator

Test data



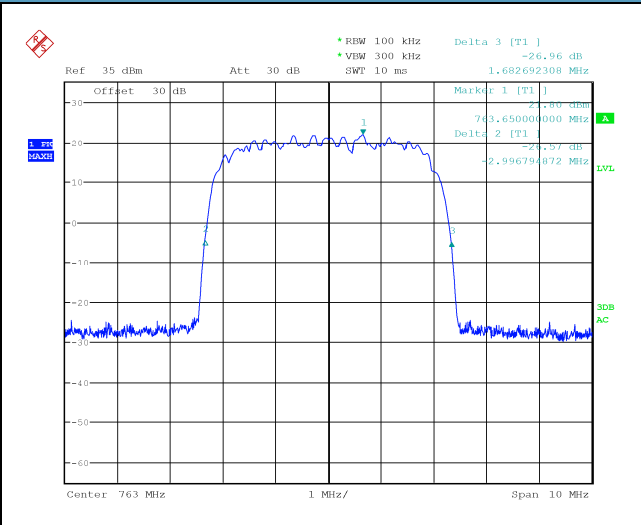
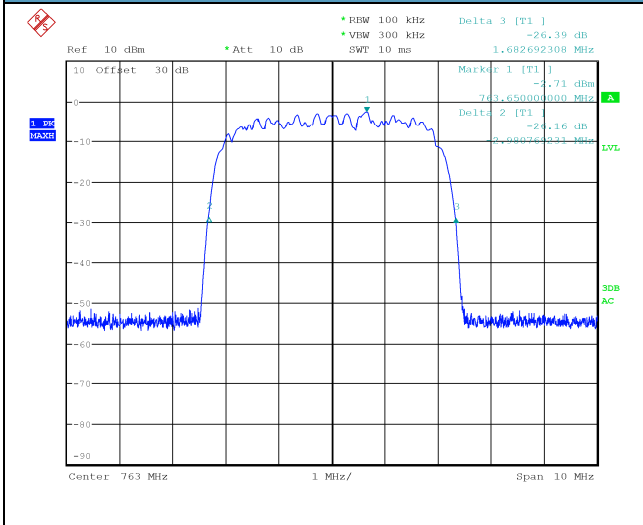
Input



Output Antenna 1

26 dB bandwidth with input at AGC threshold at 634.5 MHz

Test data

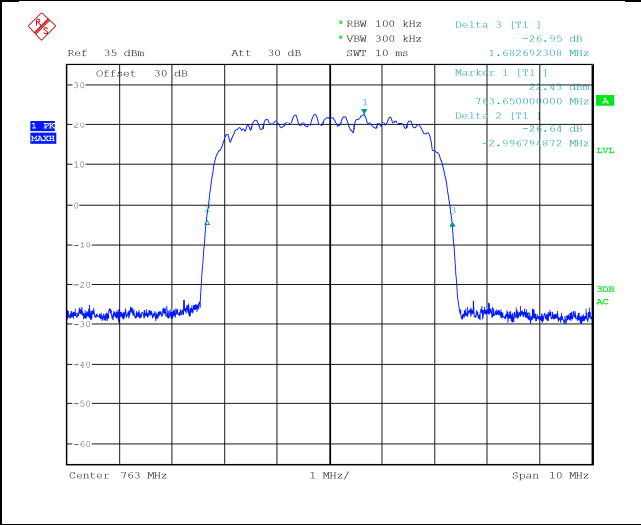
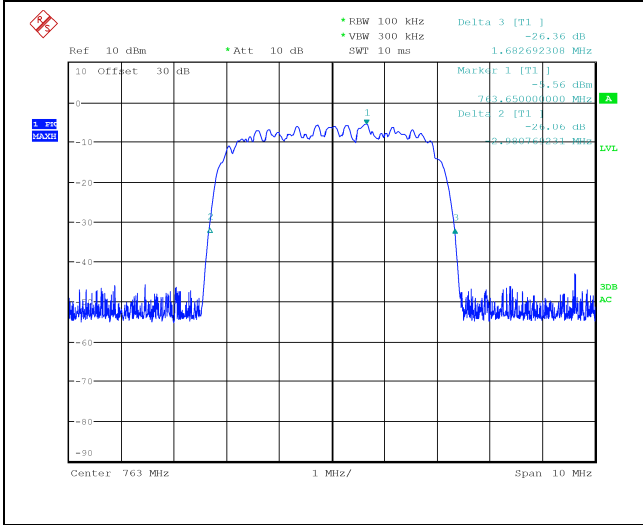


Input

Output Antenna 1

26 dB bandwidth with input at AGC threshold +3dB at 634.5 MHz

Test data

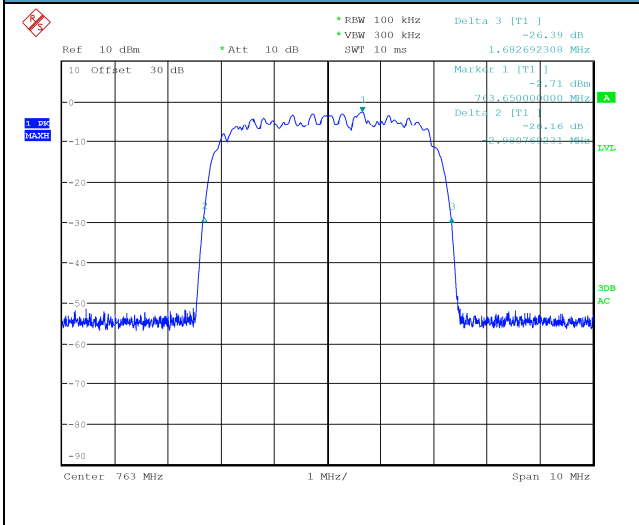


Input

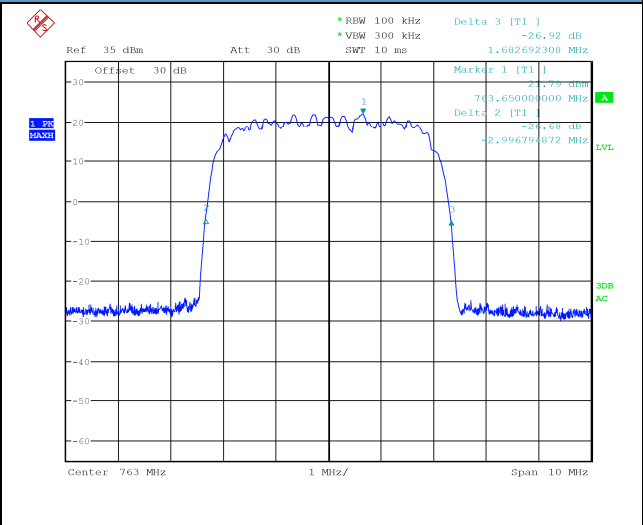
Output Antenna 2

26 dB bandwidth with input at AGC threshold at 634.5 MHz

Test data



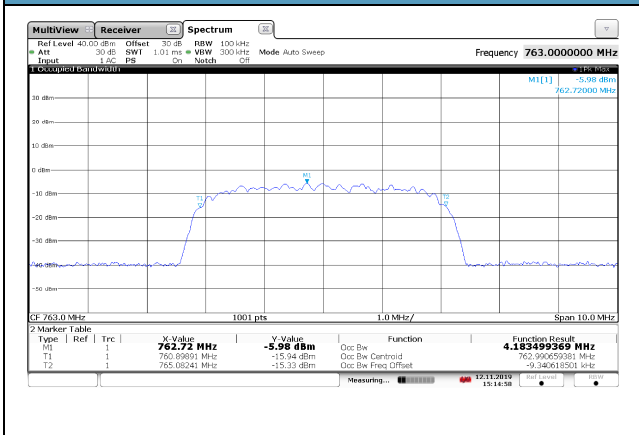
Input



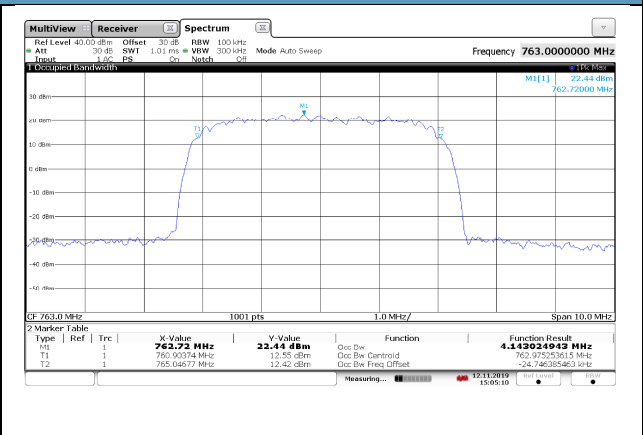
Output Antenna 2

26 dB bandwidth with input at AGC threshold +3dB at 634.5 MHz

Test data



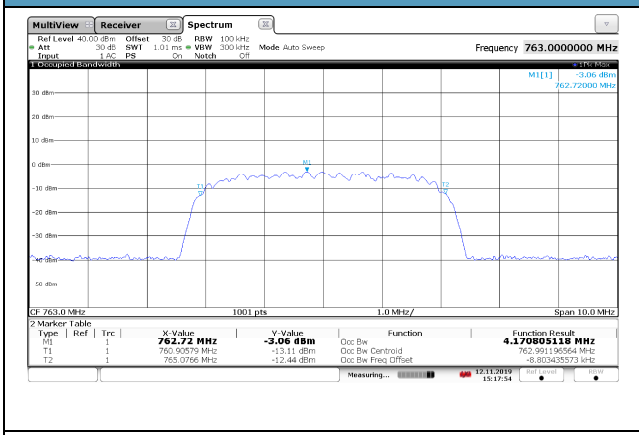
Input



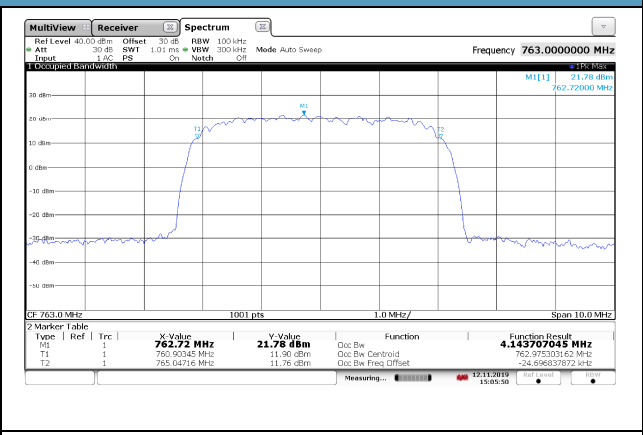
Output Antenna 1

99% occupied band with input at AGC threshold at 763 MHz

Test data



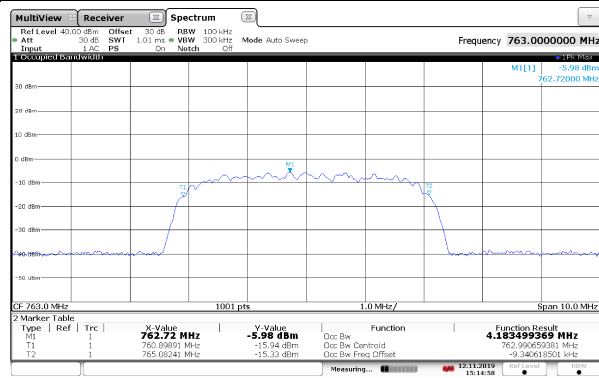
Input



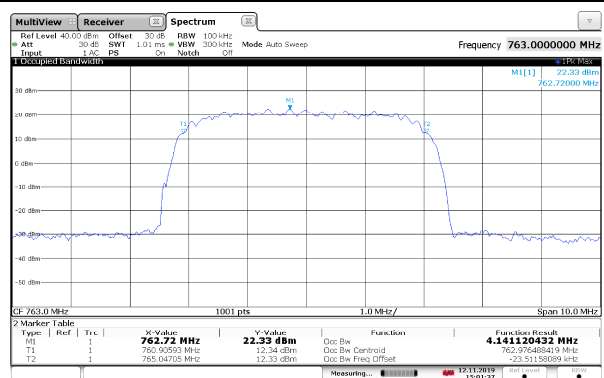
Output Antenna 1

99% occupied band input at AGC threshold +3dB at 763 MHz

Test data



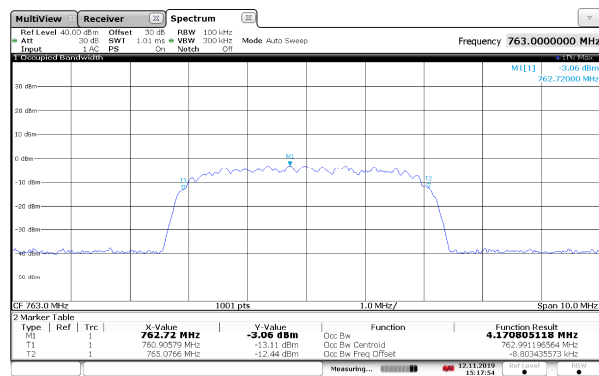
Input



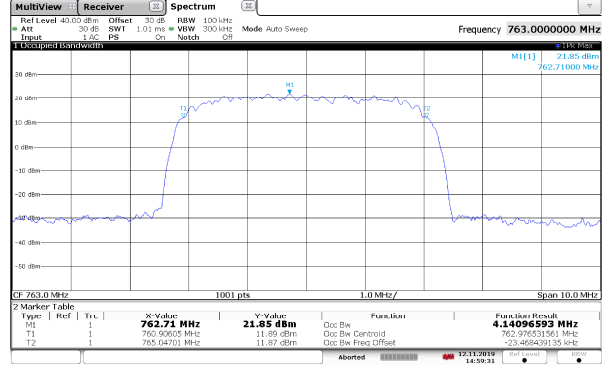
Output Antenna 2

99% occupied band with input at AGC threshold with at 763 MHz

Test data



Input



Output Antenna 2

99% occupied band input at AGC threshold +3dB at 763 MHz

6.4 Input/output power and amplifier/booster gain

FCC 90.542(a)

The following power limits apply to the 758-768/788-798 MHz band:

- (1) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.
- (2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section.
- (3) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.
- (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.
- (5) Licensees of fixed or base stations transmitting a signal in the 758-768 MHz band at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b) of this section.
- (6) Control stations and mobile stations transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30 watts ERP.
- (7) Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.
- (8) For transmissions in the 758-768 MHz and 788-798 MHz bands, licensees may employ equipment operating in compliance with either of the following measurement techniques:
 - The maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel.
 - (ii) A Commission-approved average power technique.

TABLE 1 TO 590.542(a)—PERMISSIBLE POWER AND ANTENNA HEIGHTS FOR BASE AND FIXED STATIONS IN THE 758-768 MHz BAND TRANSMITTING A SIGNAL WITH AN EMISSION BANDWIDTH OF 1 MHz OR LESS

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

TABLE 2 TO 590.542(a)—PERMISSIBLE POWER AND ANTENNA HEIGHTS FOR BASE AND FIXED STATIONS IN THE 758-768 MHz BAND TRANSMITTING A SIGNAL WITH AN EMISSION BANDWIDTH OF 1 MHz OR LESS

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150
Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

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 5.2.3

The zone enhancer gain shall not exceed the nominal gain by more than 1.0 dB. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

RSS-140 clause 4.3

The equivalent radiated power (e.r.p.) for control and mobile equipment shall not exceed 30 W. The e.r.p. for portable equipment including handheld devices shall not exceed 3 W. Fixed and base station equipment shall comply with the e.r.p. limits in SRSP-540.

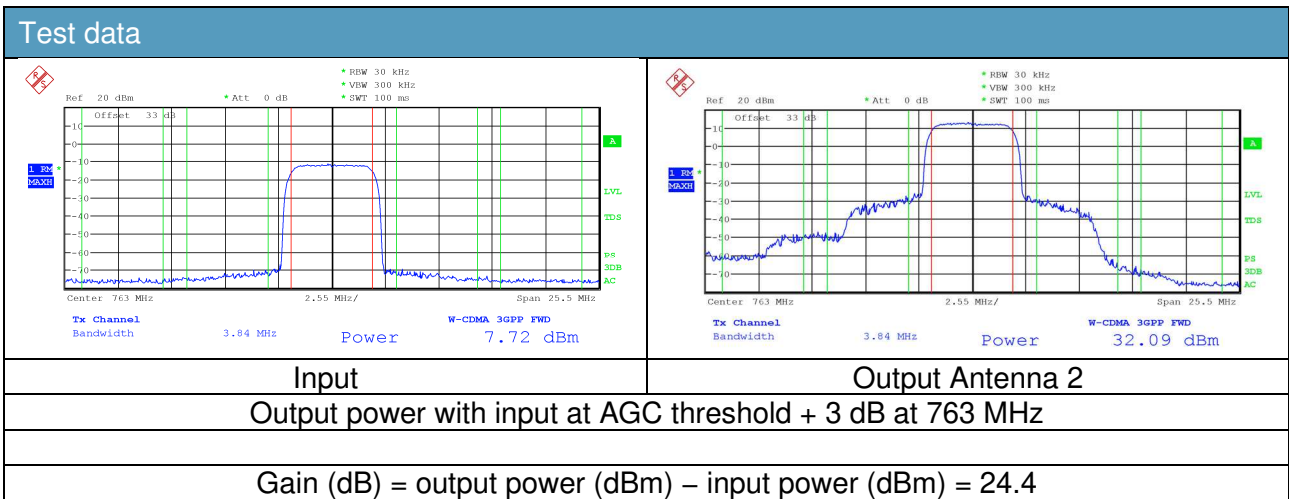
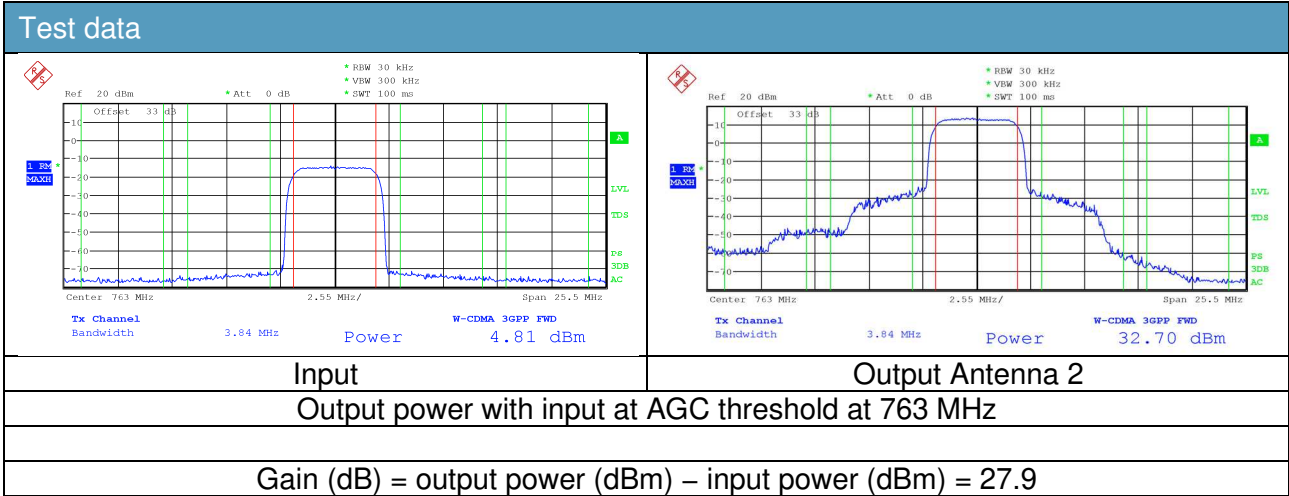
In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

Test date: 2019-11-12
Test results: Pass

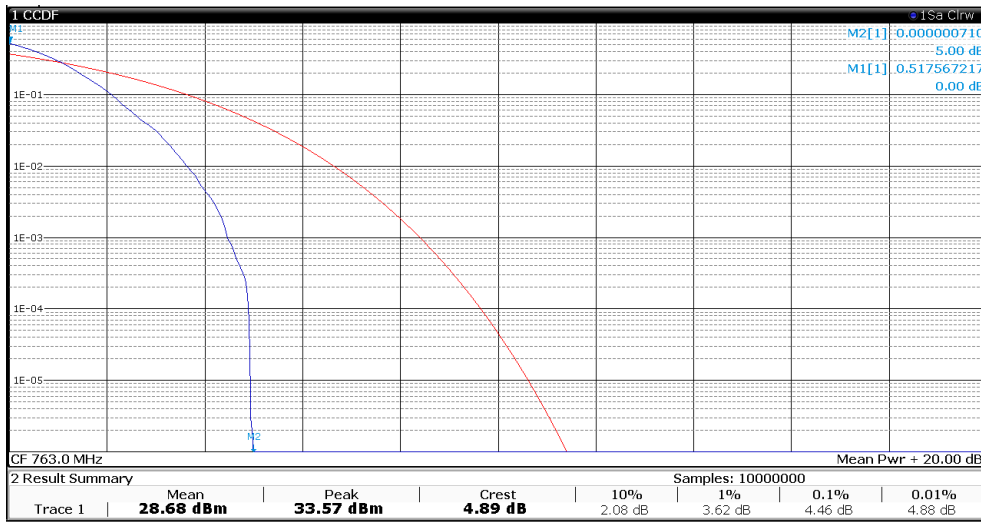
Special notes
Signal stimulation: AWGN5
Offset: 33 dB due to 30 dB physical attenuator and 3 dB (10log(N _{ANT})) due to KDB662911 Multiple Transmitter Output

Test data	
Input	Output Antenna 1
Output power with input at AGC threshold at 763 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 27.9	

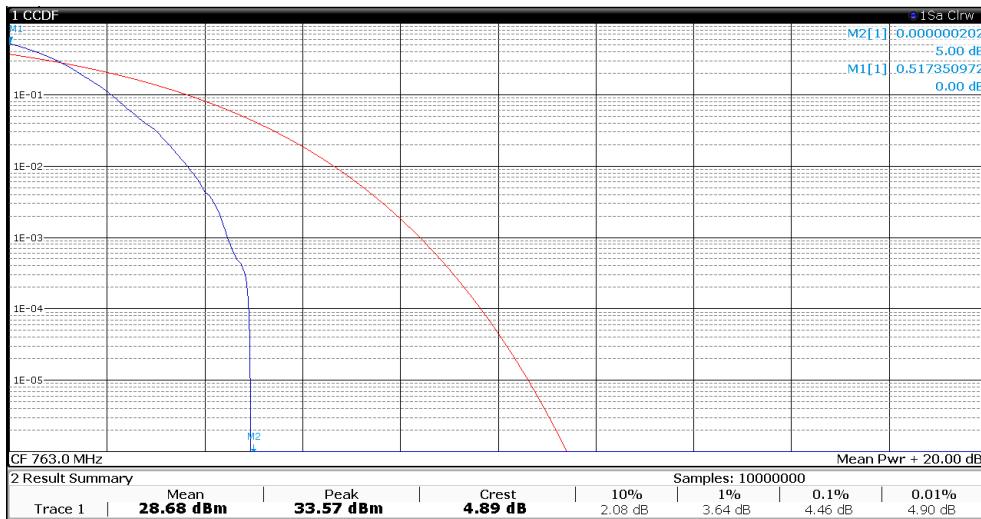
Test data	
Input	Output Antenna 1
Output power with input at AGC threshold + 3 dB at 763 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 24.4	



PAPR			
Antenna	Value 0.1 % (dB)	Limit (dB)	Verdict
1	4.5	13.0	Pass
2	4.5	13.0	Pass



Antenna 1



Antenna 2

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.

Test date: 2019-11-12

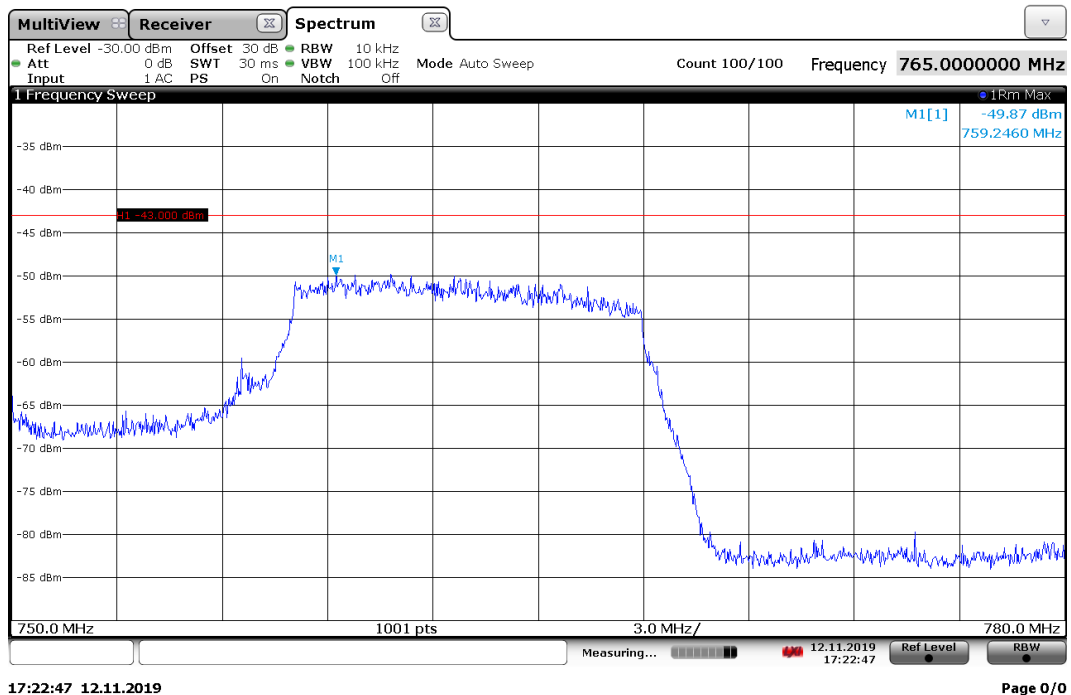
Test results: Pass

Special notes

Spectrum analyzer settings:

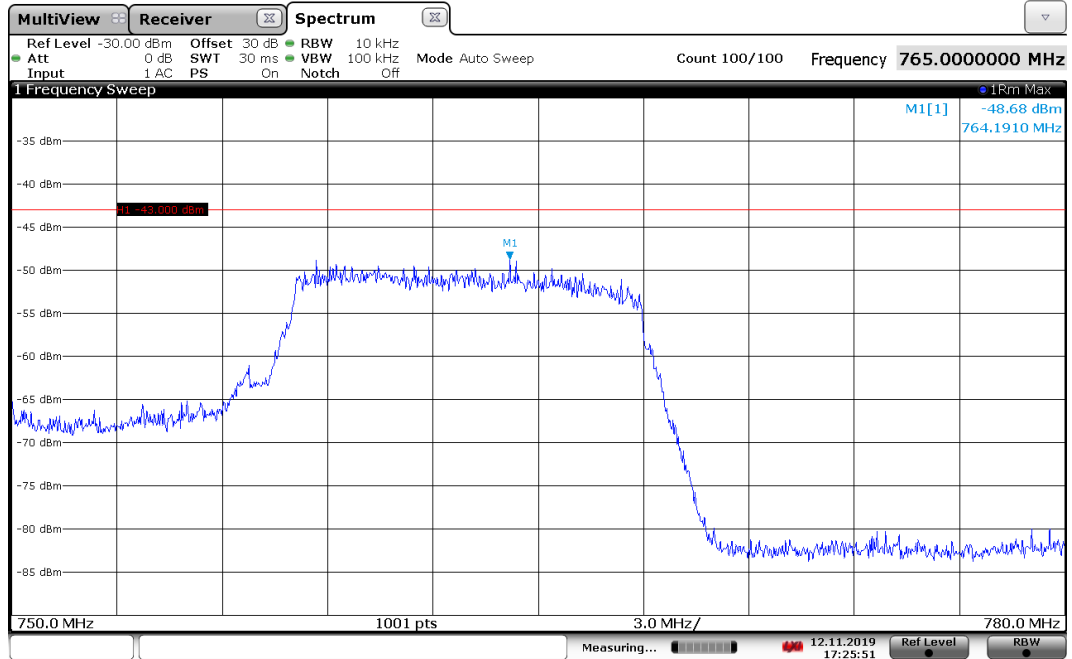
Resolution bandwidth	10 kHz
Video bandwidth	$\geq 3 \times$ RBW
Frequency span	25 MHz
Detector mode	Rms
Trace mode	Max Hold

Test data



Antenna 1

Test data



17:25:51 12.11.2019

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Antenna 2

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

FCC 90.543(e)(1)(3)

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

FCC 90.219(e)(3)

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

RSS-141 clause 4.4 (a)(b)

The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

- a) For any frequency between 769-775 MHz and 799-806 MHz:
 - $76 + 10 \log (p)$, dB in a 6.25 kHz band for fixed and base station equipment
 - ii) $65 + 10 \log (p)$, dB in a 6.25 kHz band for mobile and portable/hand-held equipment
- b) For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: $43 + 10 \log (p)$, dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

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

Test date: 2019-11-18

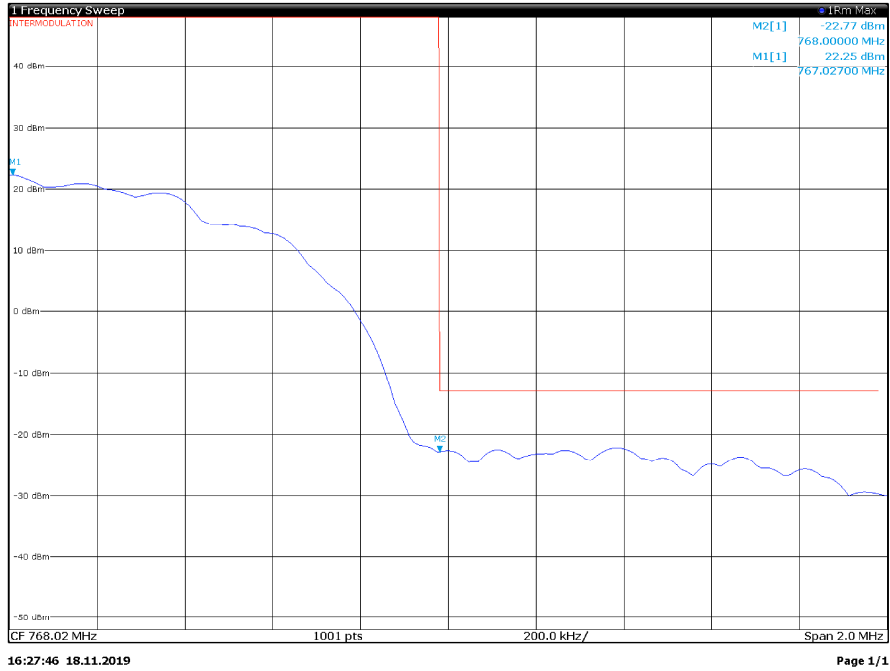
Test results: Pass

Special notes

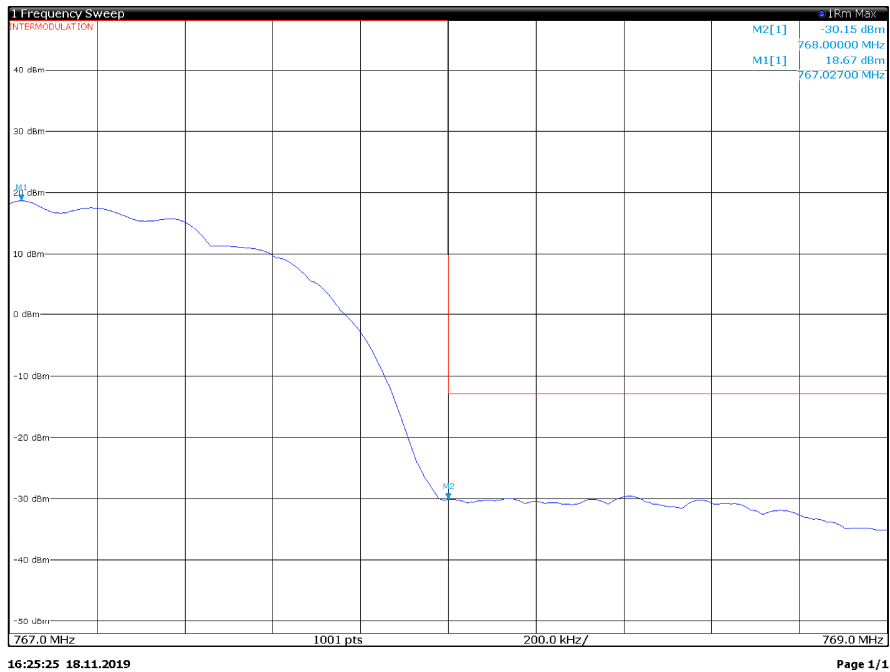
Signal stimulation: AWGN5

Offset: 33 dB due to 30 dB physical attenuator and 3 dB ($10 \log(N_{ANT})$) due to KDB662911 Multiple Transmitter Output

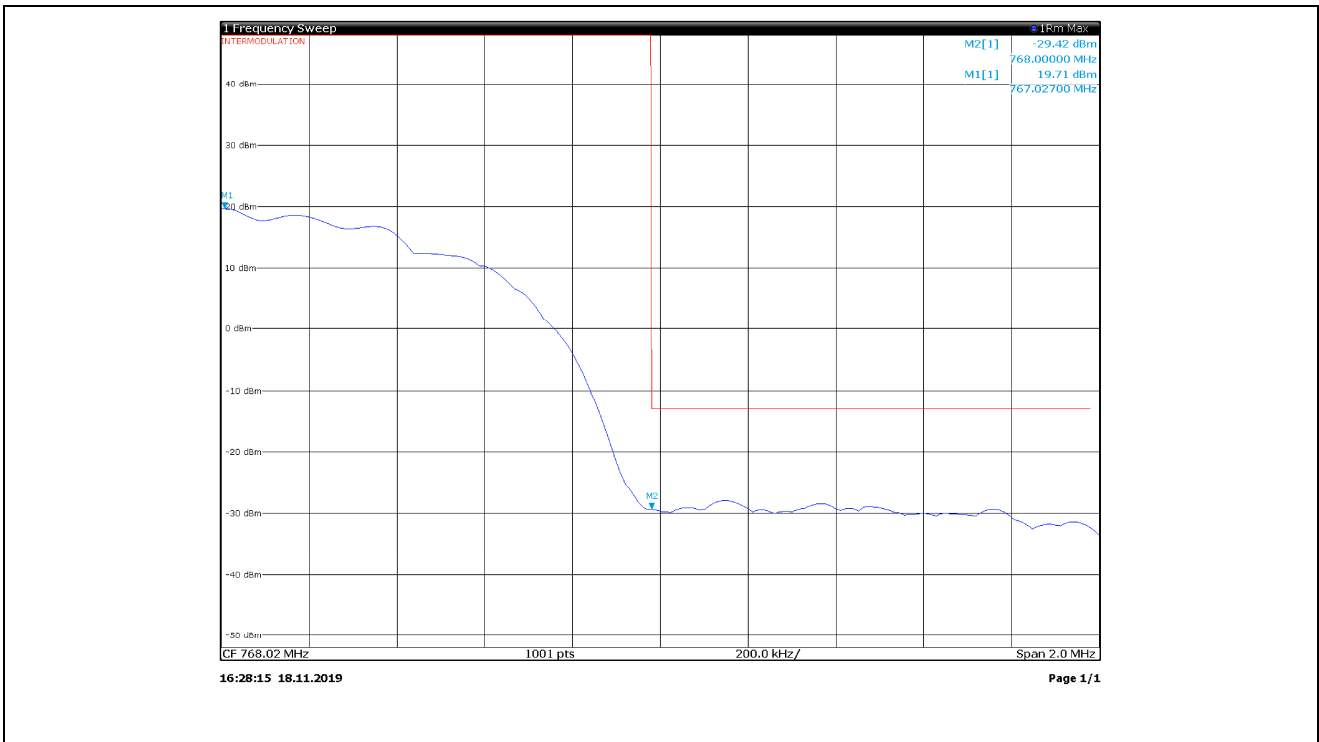
Test data



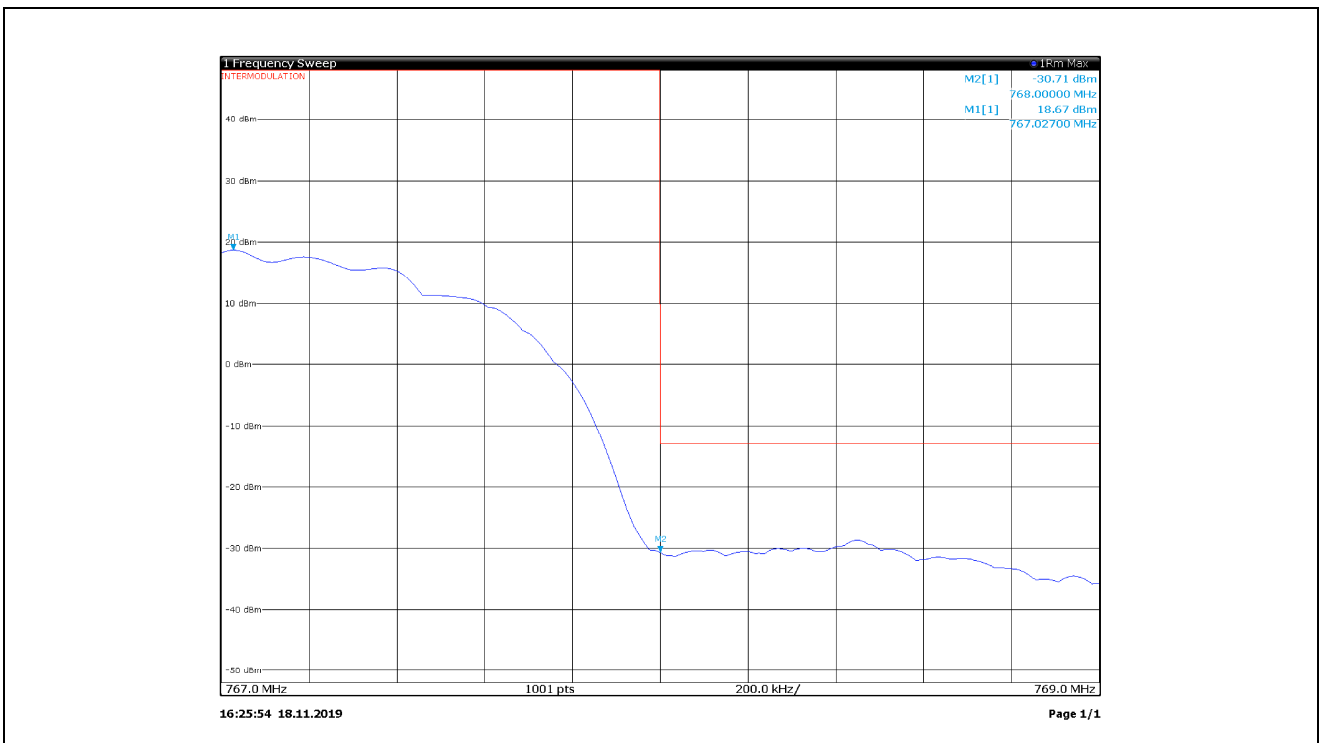
Upper block edge intermodulation products with input at AGC threshold, Antenna 1



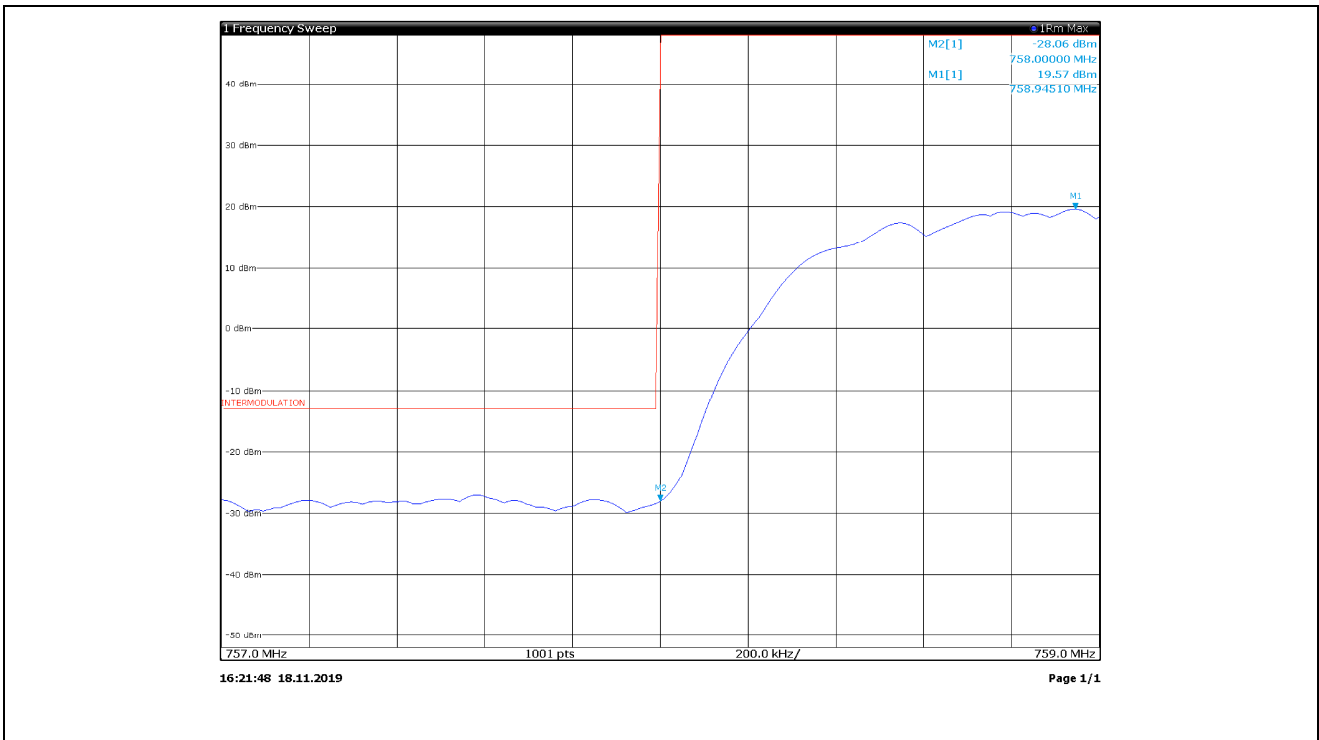
Upper block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 1



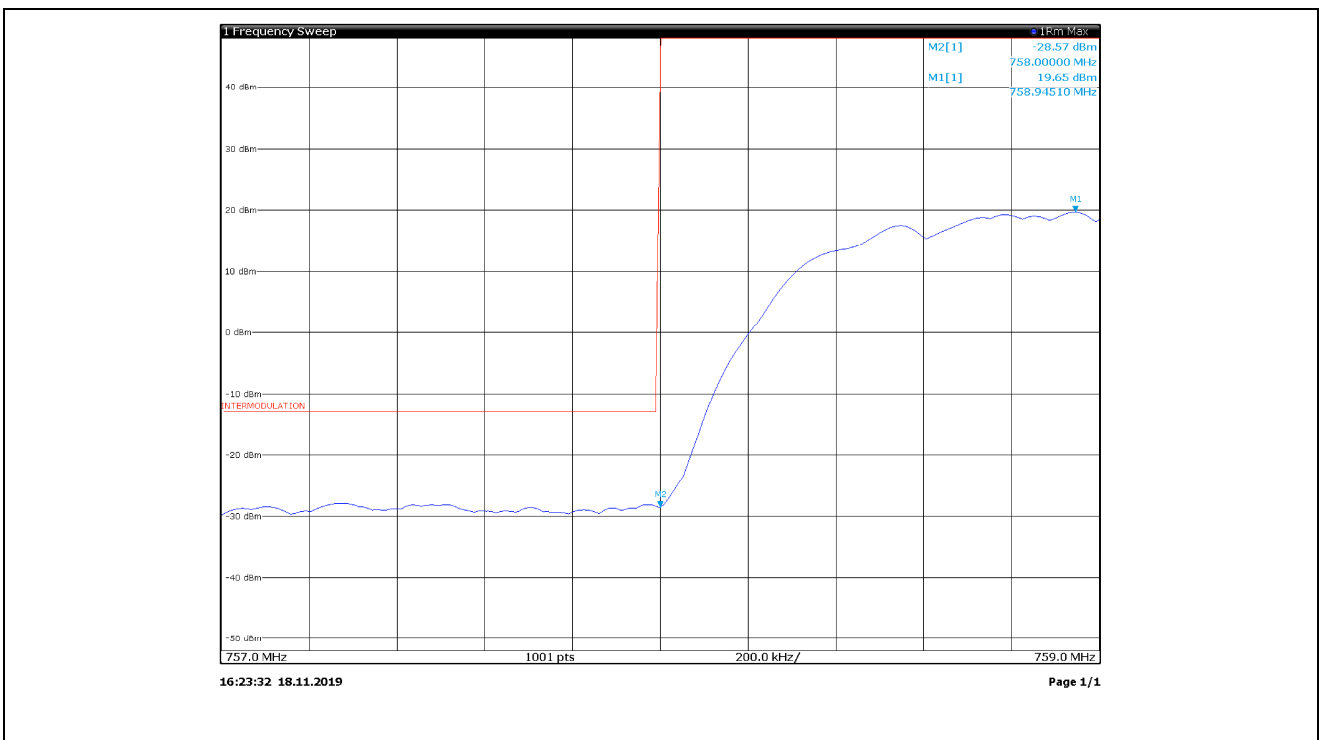
Upper block edge intermodulation products with input at AGC threshold, Antenna 2



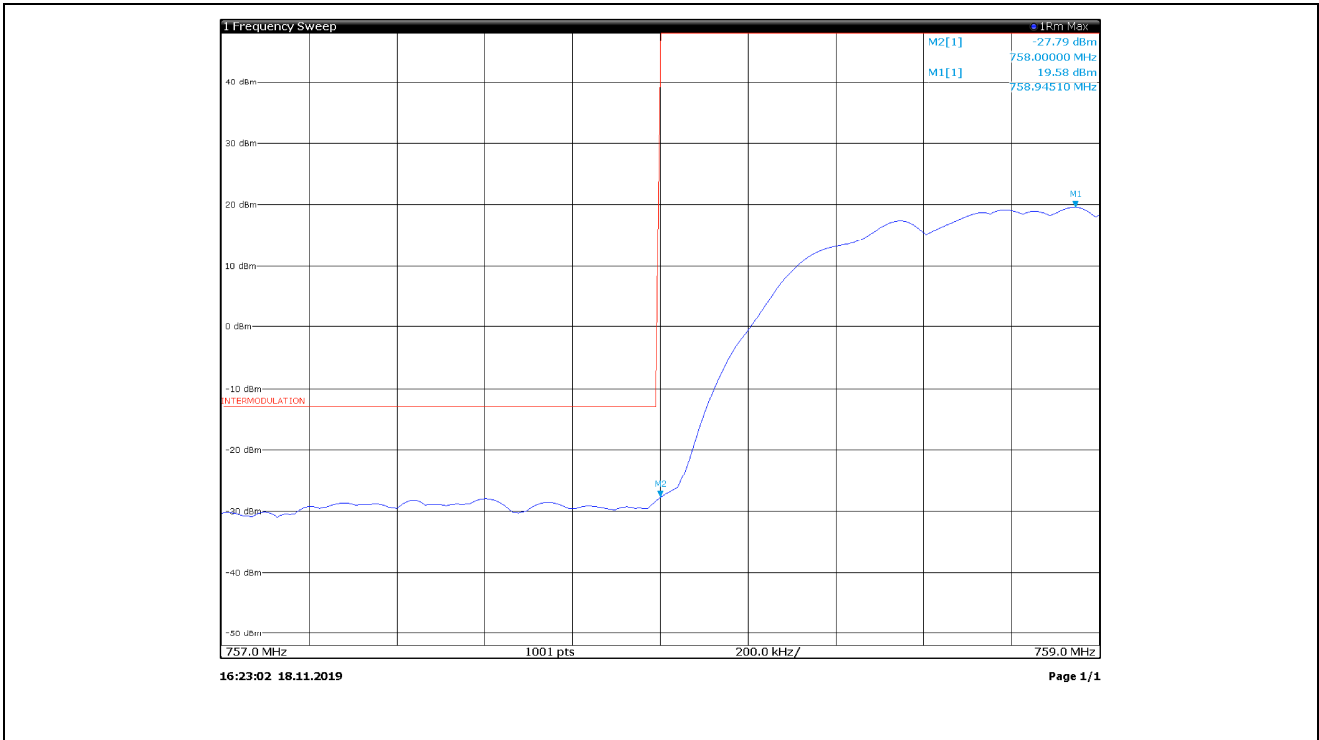
Upper block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 2



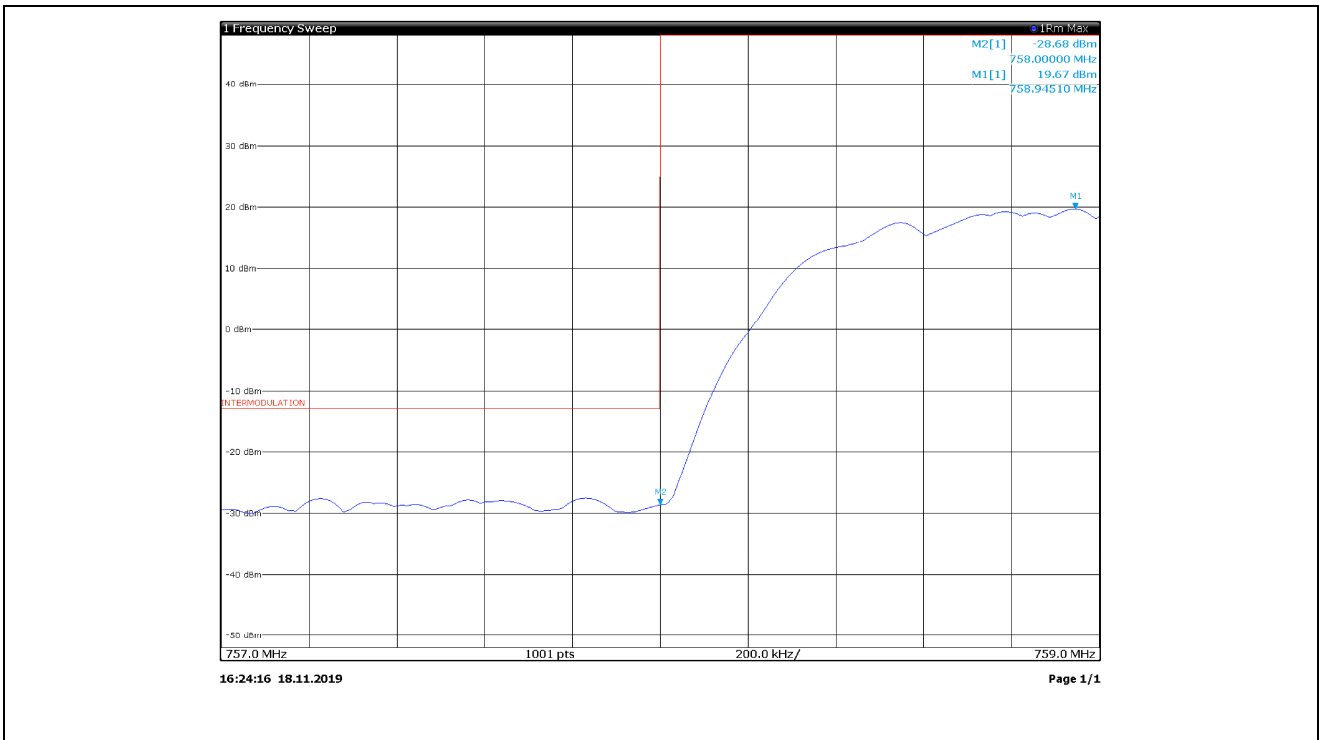
Lower block edge intermodulation products with input at AGC threshold, Antenna 1



Lower block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 1



Lower block edge intermodulation products with input at AGC threshold, Antenna 2



Lower block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 2

6.7 EUT spurious emissions conducted measurements

FCC 90.543(e)(1)(3)

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (4) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

FCC 90.543(f)

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-141 clause 4.4 (a)(b)

The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

- a) For any frequency between 769-775 MHz and 799-806 MHz:
 - $76 + 10 \log (p)$, dB in a 6.25 kHz band for fixed and base station equipment
 - ii) $65 + 10 \log (p)$, dB in a 6.25 kHz band for mobile and portable/hand-held equipment
- b) For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: $43 + 10 \log (p)$, dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

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

Test date: 2019-06-19

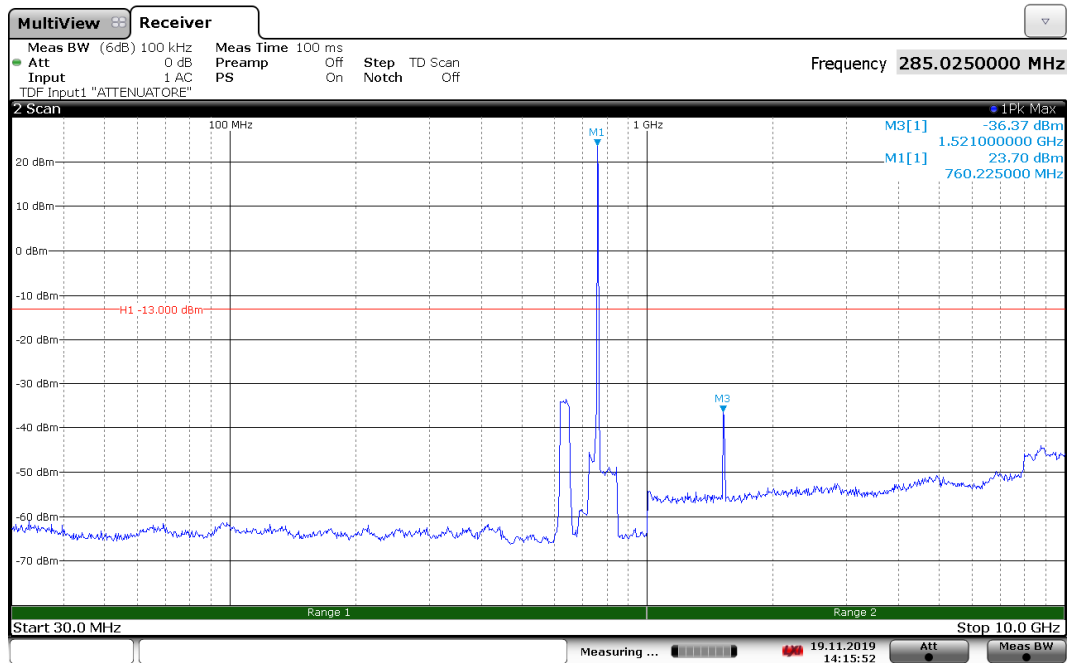
Test results: Pass

Special notes

Signal stimulation: AWGN5

Offset: 33 dB due to 30 dB physical attenuator and 3 dB ($10\log(N_{ANT})$) due to KDB662911 Multiple Transmitter Output
--

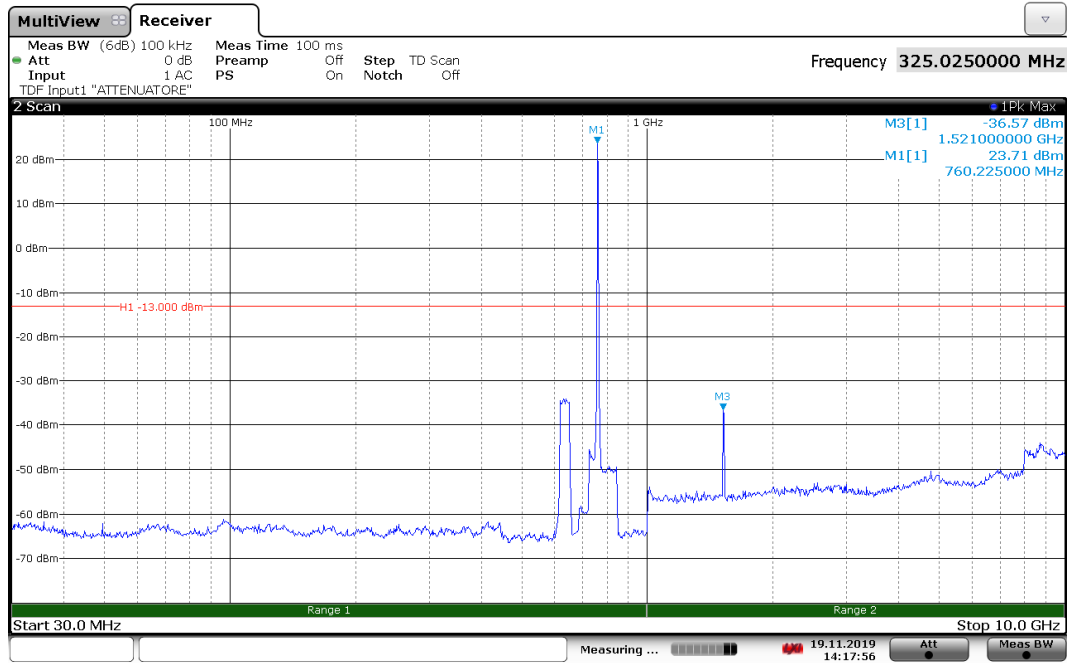
Test data



14:15:52 19.11.2019

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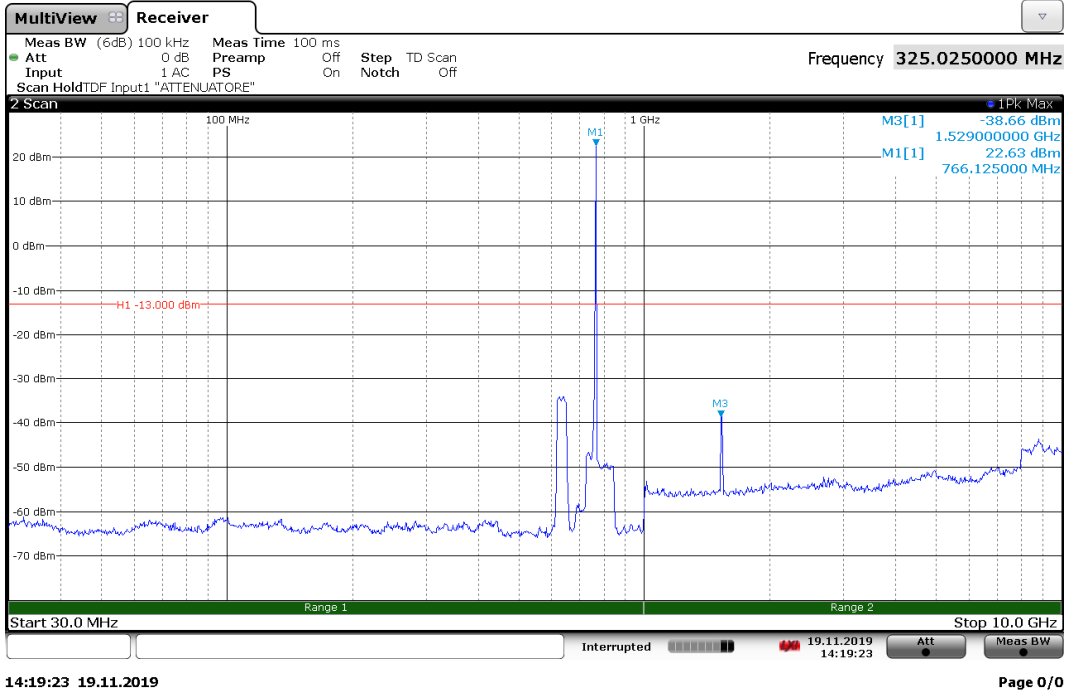
Spurious conducted emissions with input at AGC threshold at 760.5 MHz, Antenna 1



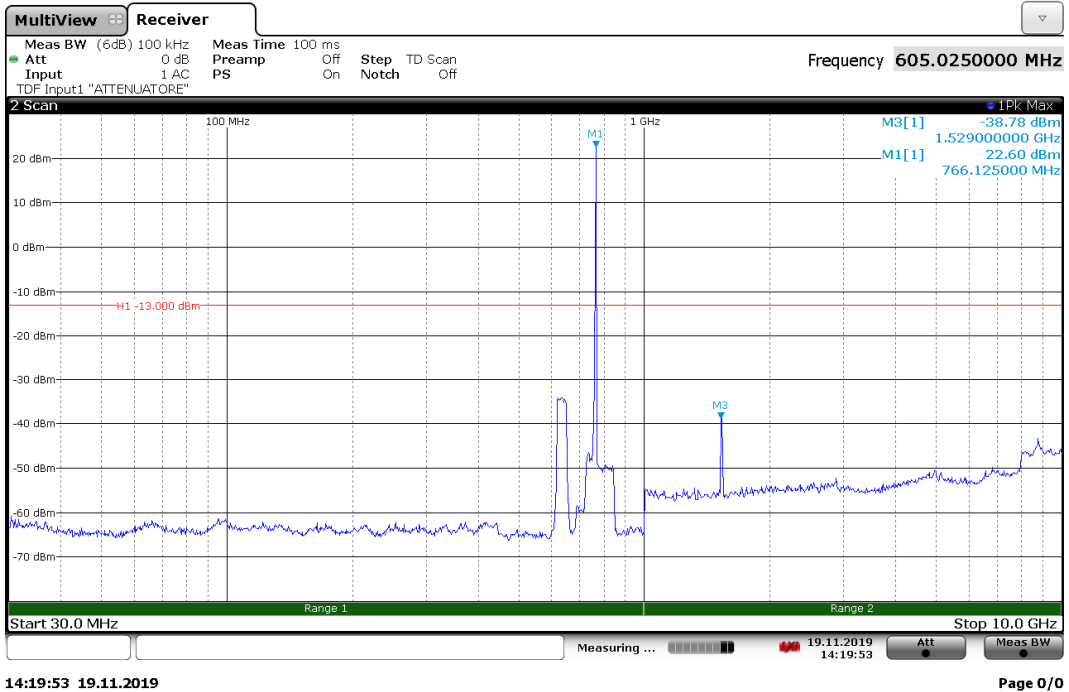
14:17:56 19.11.2019

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Spurious conducted emissions with input at AGC threshold at 760.5 MHz, Antenna 2

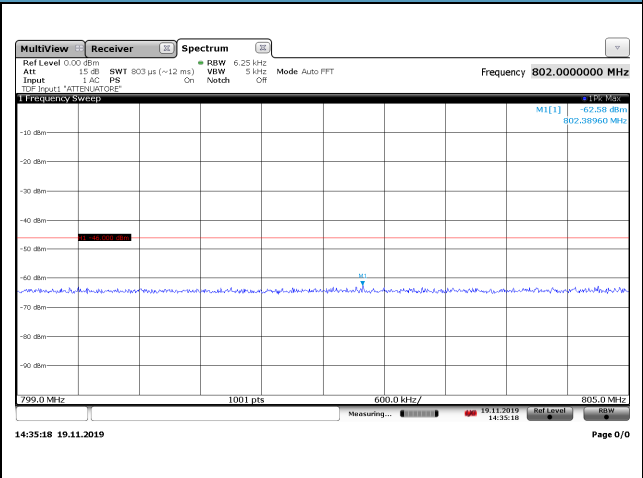
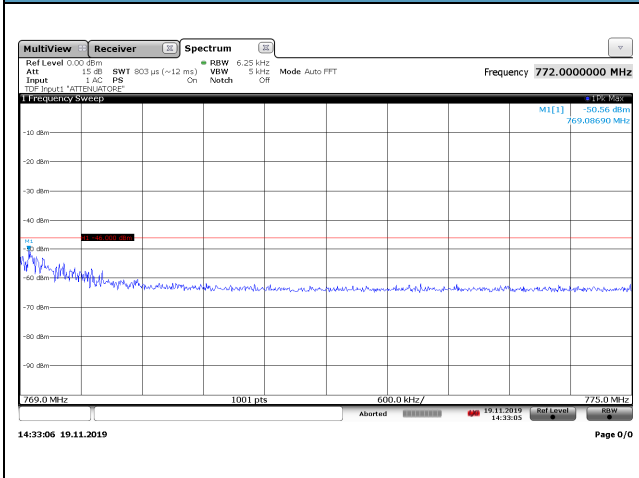


Spurious conducted emissions with input at AGC threshold at 765.5 MHz, Antenna 1

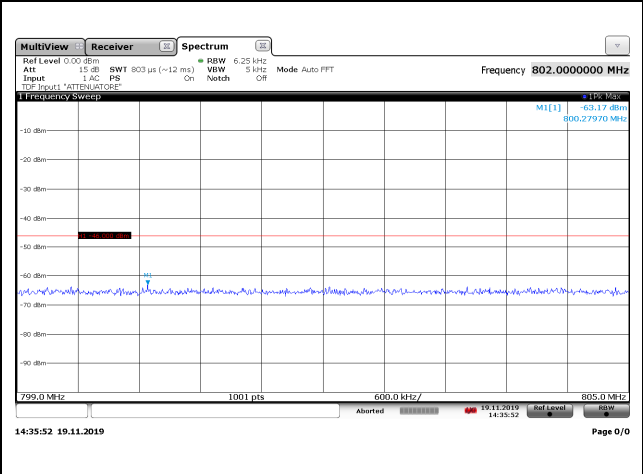
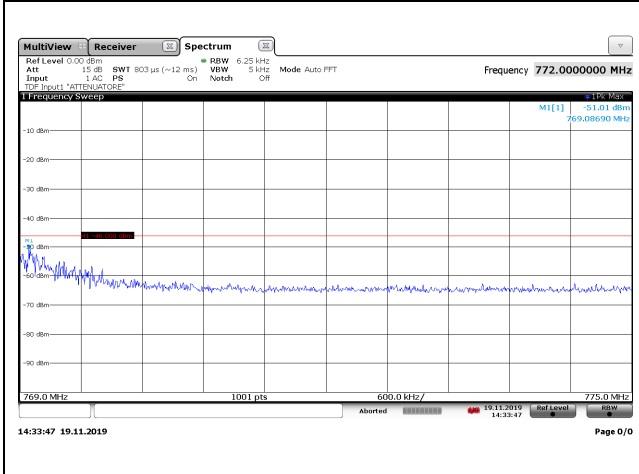


Spurious conducted emissions with input at AGC threshold at 765.5 MHz, Antenna 2

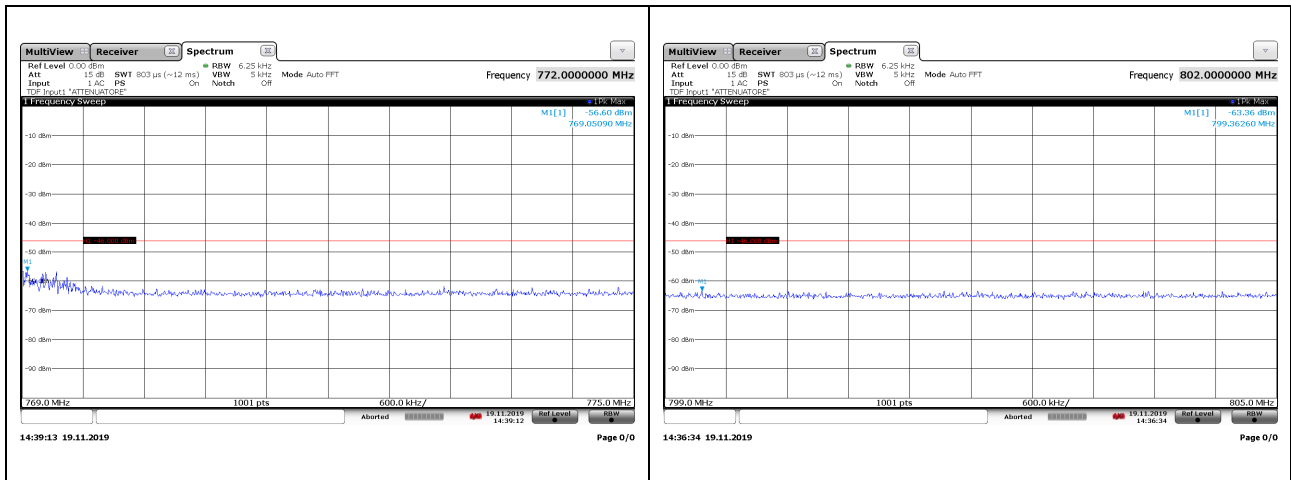
Test data



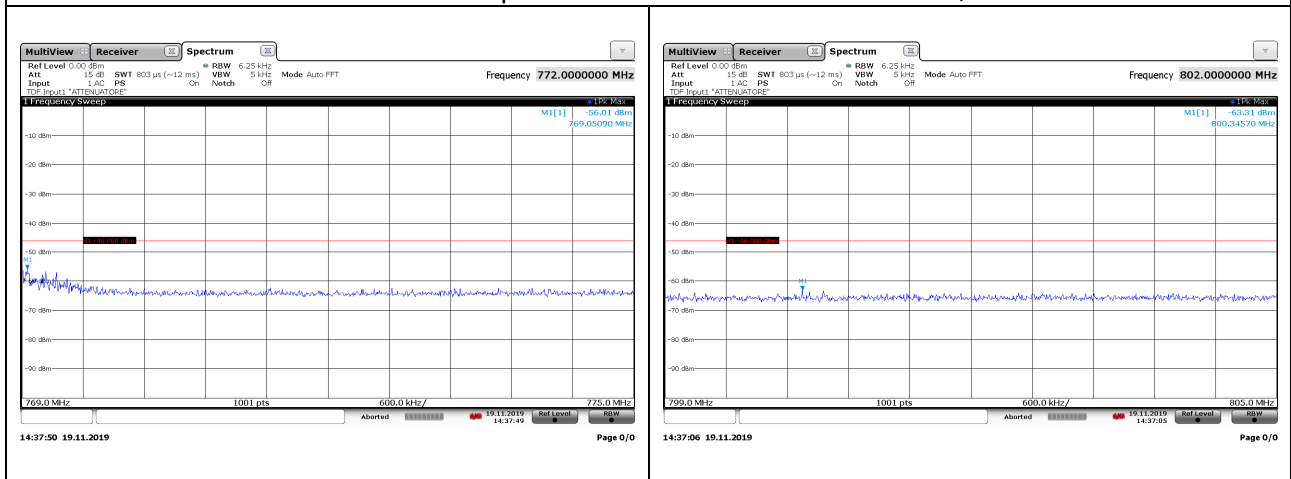
Protection bands with input at AGC threshold at 760.5 MHz, Antenna 1



Protection bands with input at AGC threshold at 760.5 MHz, Antenna 2

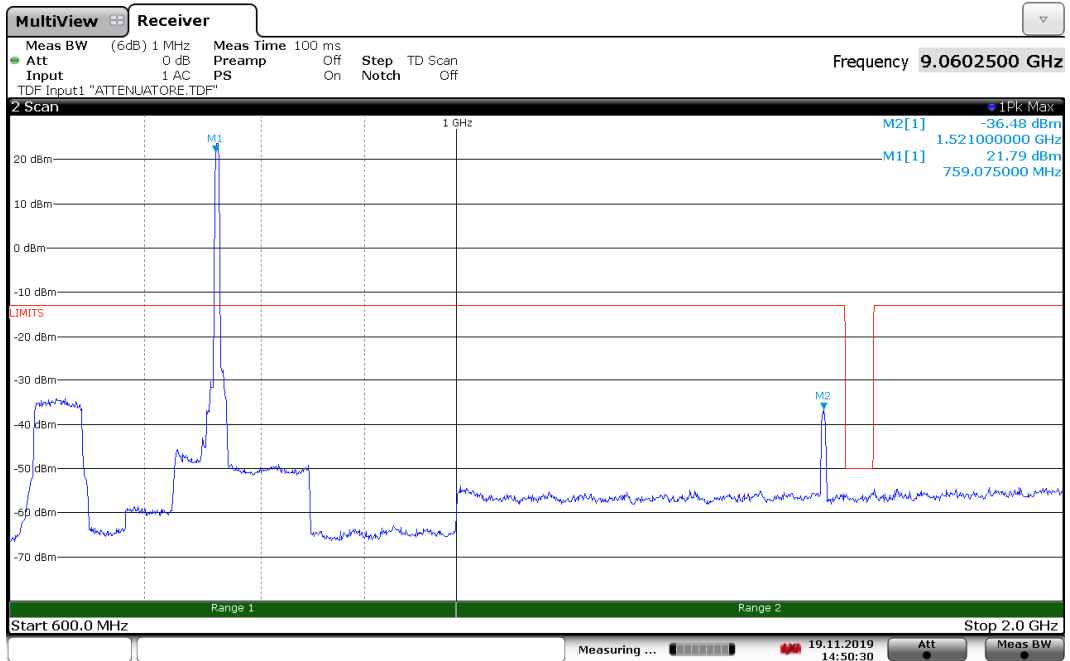


Protection bands with input at AGC threshold at 765.5 MHz, Antenna 1



Protection bands with input at AGC threshold at 765.5 MHz, Antenna 2

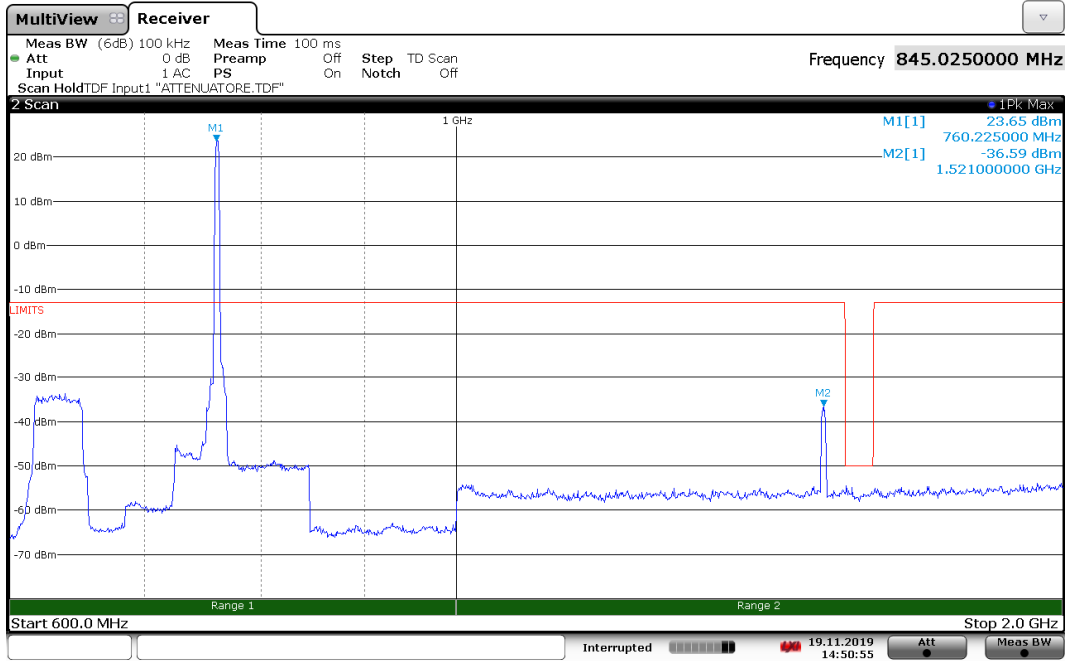
Test data



14:50:31 19.11.2019

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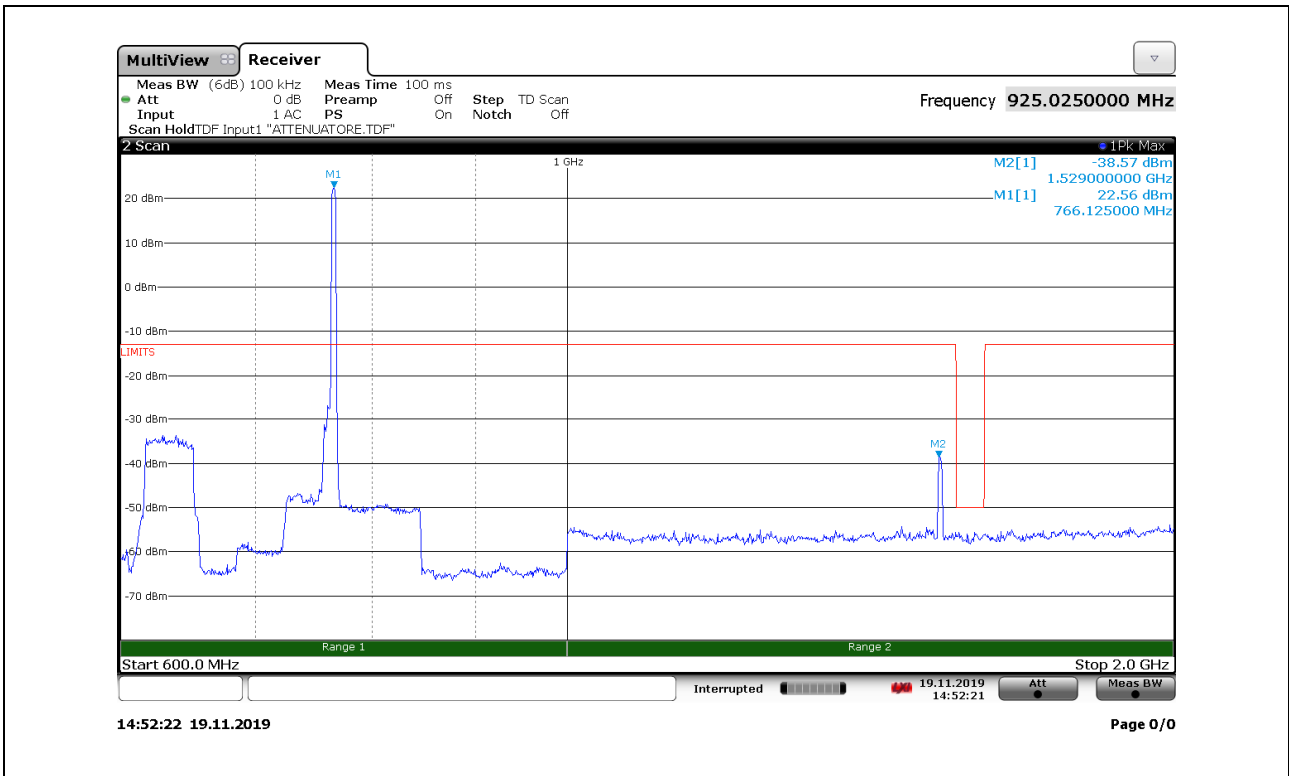
Protection band with input at AGC threshold at 760.5 MHz, Antenna 1



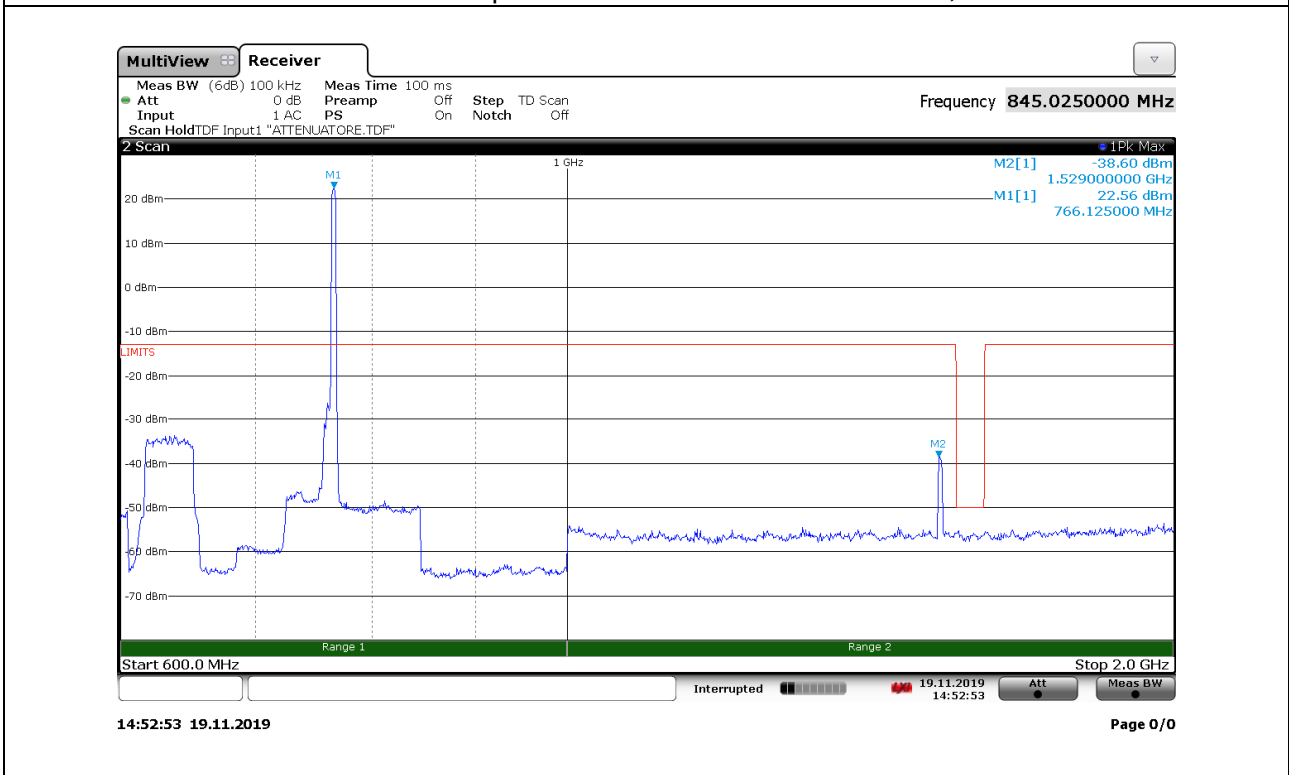
14:50:55 19.11.2019

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Protection band with input at AGC threshold at 760.5 MHz, Antenna 2



Protection band with input at AGC threshold at 765.5 MHz, Antenna 1



Protection band with input at AGC threshold at 765.5 MHz, Antenna 2

6.8 Frequency stability measurements

FCC 90.539(d)

The frequency stability of base transmitters operating in the wideband segment must be 1 part per million or better.

RSS-131 clause 5.2.4

Industrial zone enhancers shall comply with the frequency stability given in the RSS that applies to the equipment with which the zone enhancer is to be used. In cases where the frequency stability limit is not given in the applicable RSS, the equipment shall comply with a frequency stability of ± 1.5 ppm.

For zone enhancers with no input signal processing capability, the frequency stability measurement in this section is not required.

RSS-140 clause 4.2

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested at the temperature and supply voltage variations specified in RSS-Gen.

Test date: 2019-11-13
Test results: Pass

Special notes
Signal stimulation: AWGN5 Offset: 33 dB due to 30 dB physical attenuator

Test data			
Test conditions	Frequency, Hz	Drift, Hz	ppm
+50 °C, Nominal	762 999 972	-10	-0.01
+40 °C, Nominal	762 999 971	-9	-0.01
+30 °C, Nominal	762 999 969	-7	-0.01
+20 °C, +15 %	762 999 962	0	0.00
+20 °C, Nominal	762 999 962	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	762 999 962	0	0.00
+10 °C, Nominal	762 999 958	4	0.01
0 °C, Nominal	762 999 954	8	0.01
-10 °C, Nominal	762 999 951	11	0.01
-20 °C, Nominal	762 999 930	32	0.04
-30 °C, Nominal	762 999 910	52	0.07

Test data			
Test conditions	Frequency, Hz	Drift, Hz	ppm
+50 °C, Nominal	762 999 971	-8	-0.01
+40 °C, Nominal	762 999 971	-8	-0.01
+30 °C, Nominal	762 999 969	-6	-0.01
+20 °C, +15 %	762 999 963	0	0.00
+20 °C, Nominal	762 999 963	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	762 999 963	0	0.00
+10 °C, Nominal	762 999 959	4	0.01
0 °C, Nominal	762 999 955	8	0.01
-10 °C, Nominal	762 999 951	12	0.02
-20 °C, Nominal	762 999 931	32	0.04
-30 °C, Nominal	762 999 911	52	0.07

6.9 Spurious emissions radiated measurements

FCC 90.543(e)(1)(3)

For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

- (3) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (5) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

RSS-141 clause 4.4 (a)(b)

The power of any unwanted emission outside the bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

- a) For any frequency between 769-775 MHz and 799-806 MHz:
 - $76 + 10 \log (p)$, dB in a 6.25 kHz band for fixed and base station equipment
 - ii) $65 + 10 \log (p)$, dB in a 6.25 kHz band for mobile and portable/hand-held equipment
- b) For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: $43 + 10 \log (p)$, dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

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

Test date: 2019-11-11

Test results: Pass

Special notes

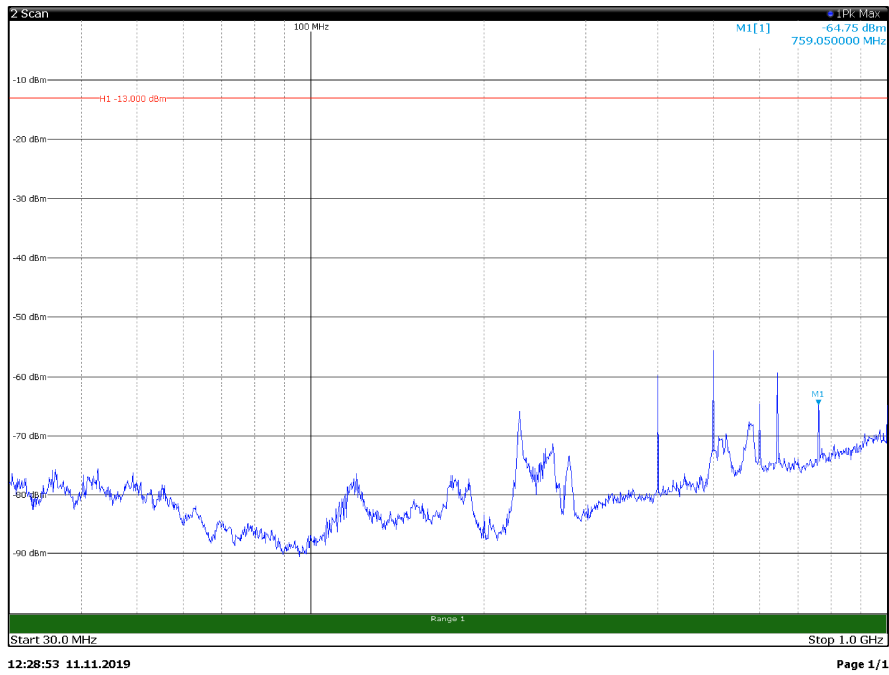
Signal stimulation: AWGN5

Offset: 33 dB due to 30 dB physical attenuator
--

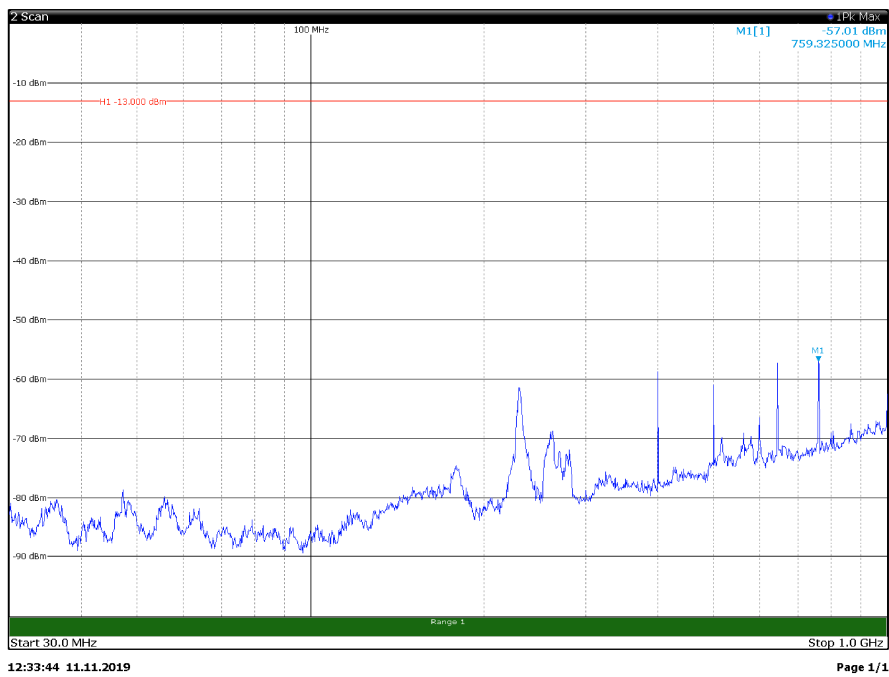
Test data

Spurious radiated emissions 30 MHz to 1 GHz

Spurious radiated emissions with input at AGC threshold at 760.5 MHz

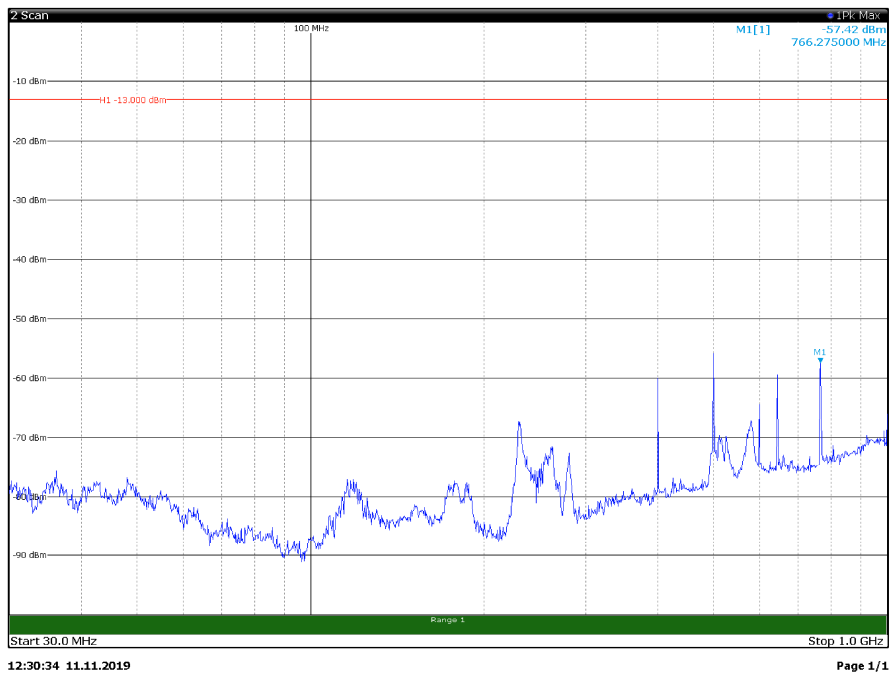


Horizontal polarization

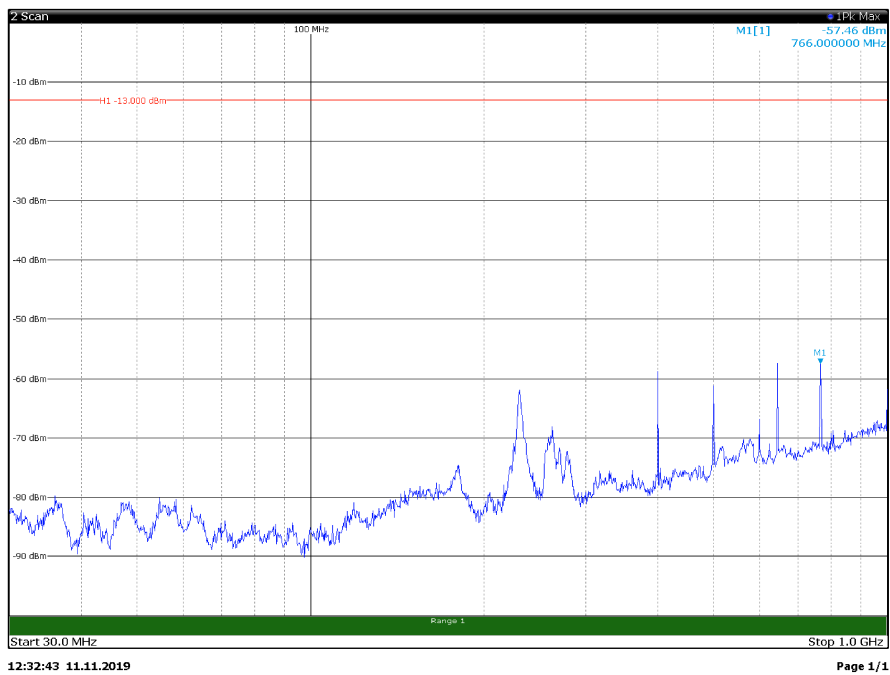


Vertical polarization

Spurious radiated emissions with input at AGC threshold at 765.5 MHz



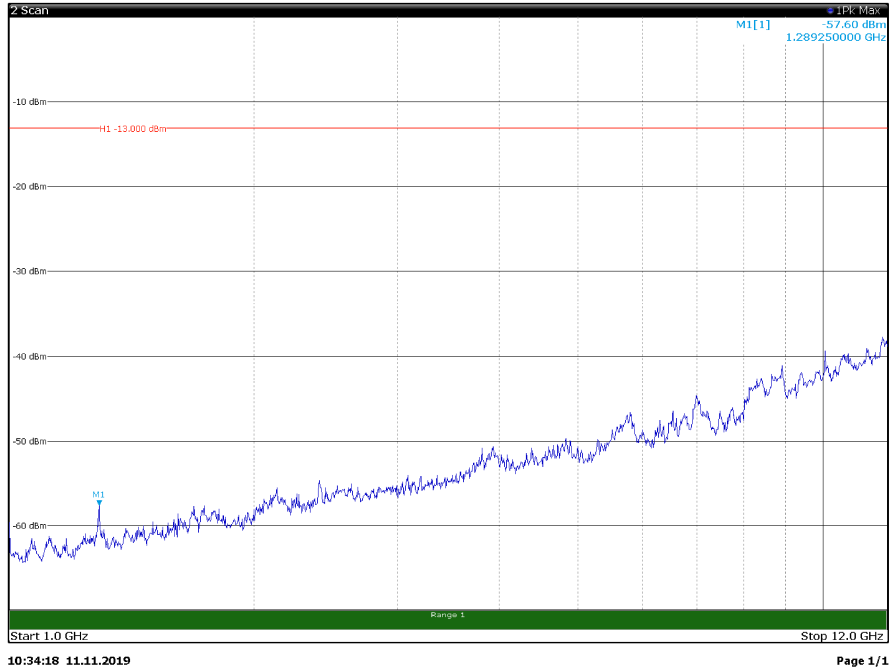
Horizontal polarization



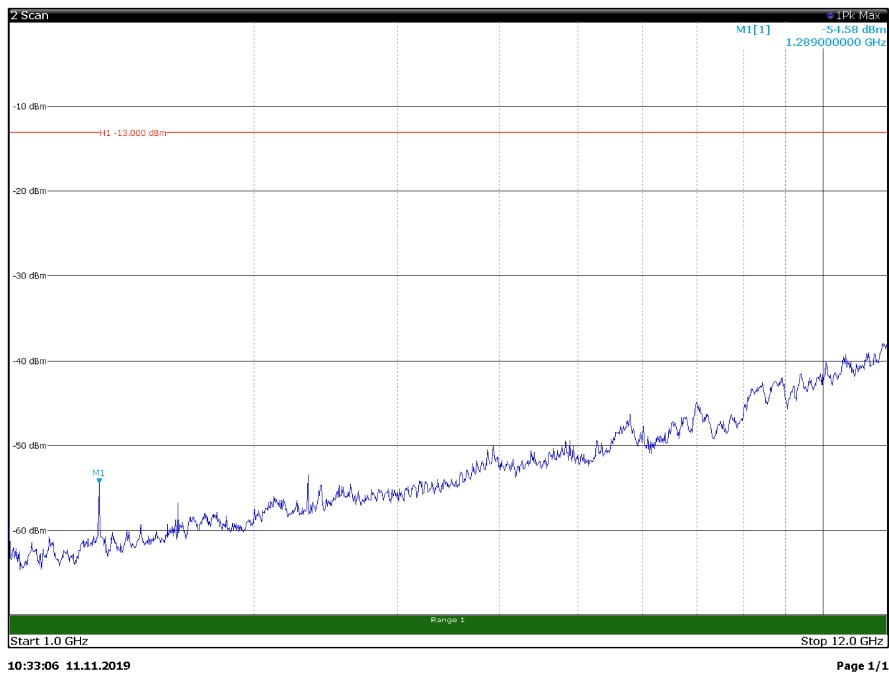
Vertical polarization

Spurious radiated emissions 1 GHz to 12 GHz

Spurious radiated emissions with input at AGC threshold at 760.5 MHz

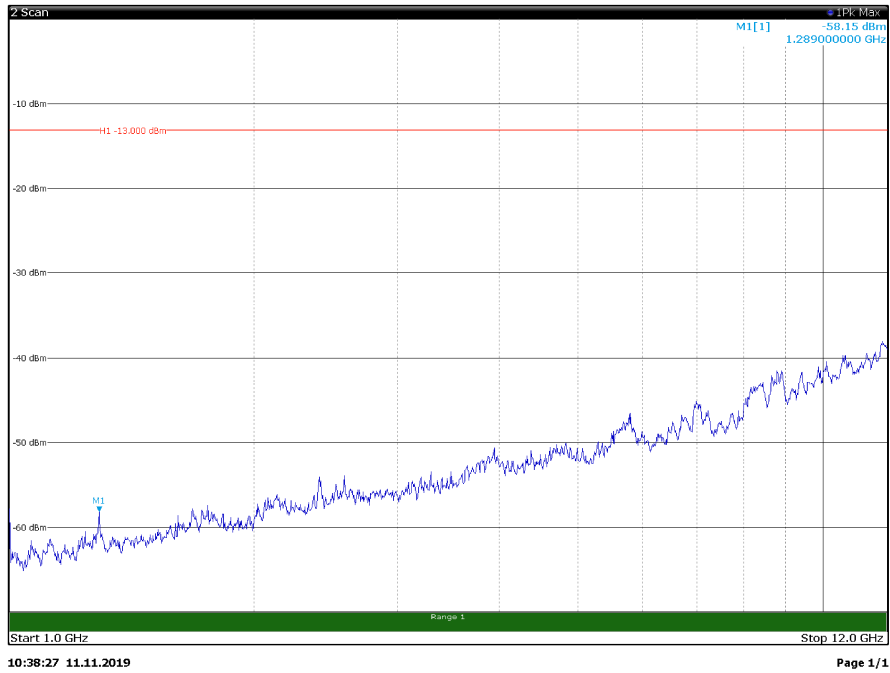


Horizontal polarization

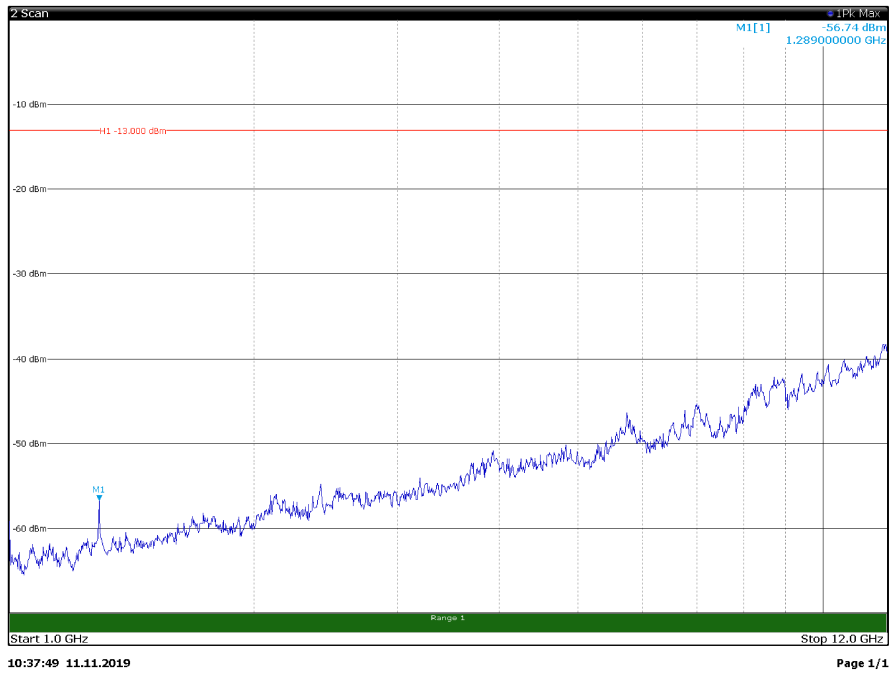


Vertical polarization

Spurious radiated emissions with input at AGC threshold at 765.5 MHz



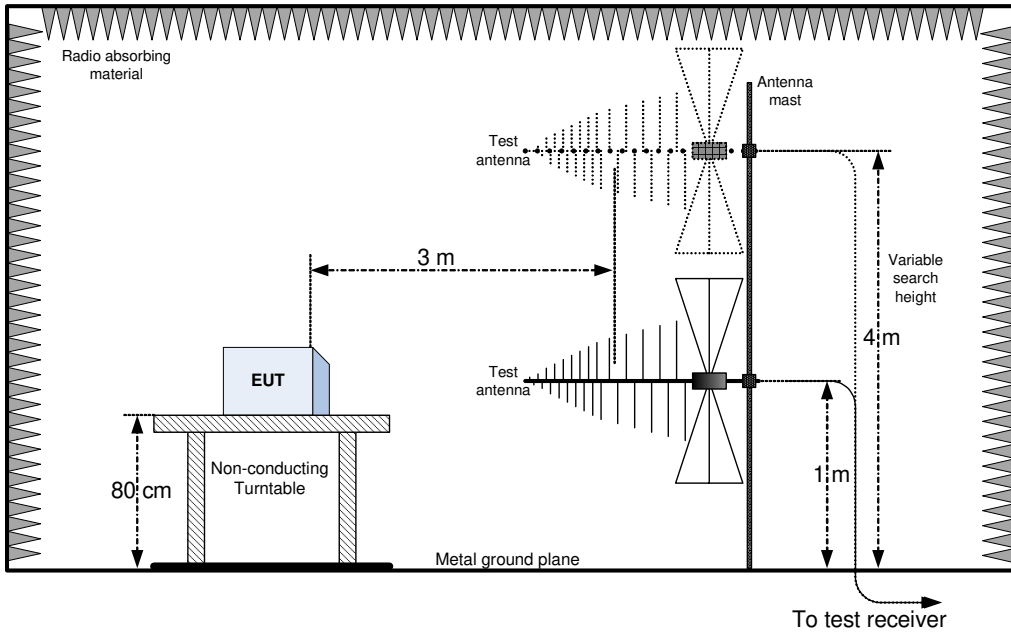
Horizontal polarization



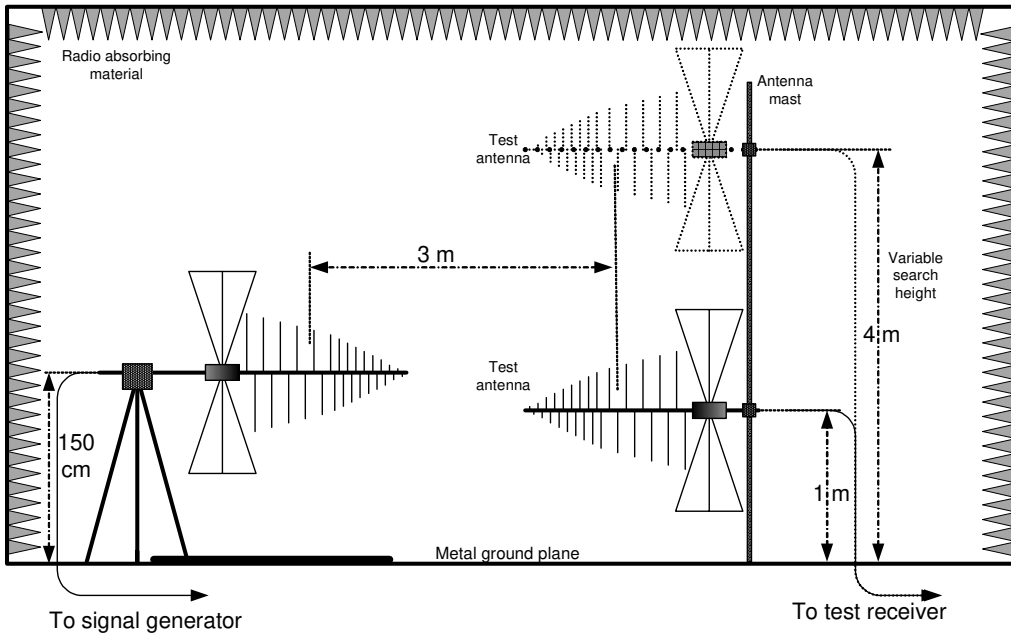
Vertical polarization

Appendix A: Block diagrams of test set-ups

Radiated emissions set-up

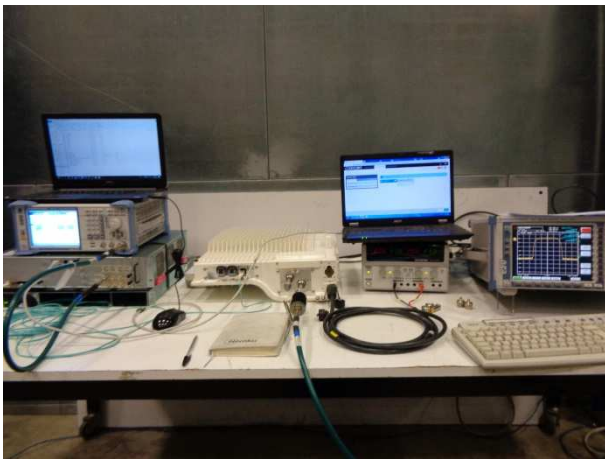
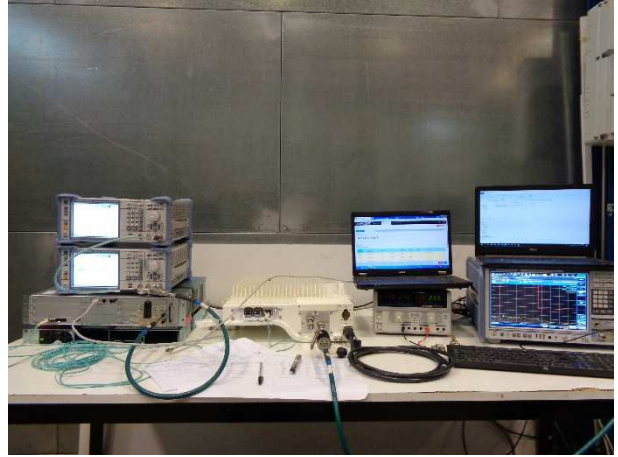


Substitution method set-up



Appendix B: Photos

Set-up photos





EUT photos





End of report