



Report Reference ID:	382048TRFWL
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Test specification:	<p>Title 47 – Telecommunication Chapter I – Federal Communications Commission Part 27 – Miscellaneous wireless communications services</p> <p>RSS-131 Issue 3 Zone Enhancers</p> <p>RSS-130 Issue 2 Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756MHz and 777-787 MHz</p>
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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	Part 27 – Miscellaneous wireless communications services RSS-131 Issue 3 – Zone Enhancers RSS-130 Issue 2 – Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756MHz and 777-787 MHz
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1.2 Statement of compliance

Compliance	In the configuration tested the EUT was found compliant Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> 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 27, RSS-131 Issue 3 and RSS-130 Issue 2. 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.
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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 27, test results			
Part	Methods	Test description	Verdict
--	935210 D05v01r03 Clause 3.2	AGC threshold	Pass
--	935210 D05v01r03 Clause 3.3	Out of band rejection	Pass
--	935210 D05v01r03 Clause 3.4	Input-versus-output signal comparison	Pass
27.50 (c)	935210 D05v01r03 Clause 3.5 662911 D01	Input/output power and amplifier/booster gain	Pass
27.53 (g)	935210 D05v01r03 Clause 3.6.2 662911 D01	Out-of-band/out-of-block emissions conducted measurements	Pass
27.53 (g)	935210 D05v01r03 Clause 3.6.3 662911 D01	EUT spurious emissions conducted measurements	Pass
27.54	935210 D05v01r03 Clause 3.7	Frequency stability measurements	Pass
27.53 (g)	935210 D05v01r03 Clause 3.8	Spurious emissions radiated measurements	Pass
Notes:			

2.2 RSS-131 and RSS-130, test results			
Part	Methods	Test description	Verdict
--	935210 D05v01r03 Clause 3.2	AGC threshold	Pass
RSS-131 §5.2.1	935210 D05v01r03 Clause 3.3	Out of band rejection	Pass
RSS-131 §5.2.2	935210 D05v01r03 Clause 3.4	Input-versus-output signal comparison	Pass
RSS-131 §5.2.3 RSS-130 §4.6.1 RSS-130 §4.6.2	935210 D05v01r03 Clause 3.5 662911 D01	Input/output power and amplifier/booster gain	Pass
RSS-130 §4.7.1	935210 D05v01r03 Clause 3.6.2 662911 D01	Out-of-band/out-of-block emissions conducted measurements	Pass
RSS-130 §4.7.1	935210 D05v01r03 Clause 3.6.3 662911 D01	EUT spurious emissions conducted measurements	Pass
RSS-131 §5.2.4 RSS-130 §4.5	935210 D05v01r03 Clause 3.7	Frequency stability measurements	Pass
RSS-130 §4.7.1	935210 D05v01r03 Clause 3.8	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	B2I	
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:	382048-1/3

3.8 EUT technical specifications	
Operating band:	617 – 652 MHz
Operating frequency:	Wideband
Occupied bandwidth:	4.16 MHz
Channel spacing:	Standard
Emission designator:	W7D, W7E
RF Output	Down Link: 32.6 dBm Up Link: The EUT does not transmit over the air in the up-link direction
Gain	Down Link: 28 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 $\pm 5\%$, 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)
	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	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 3.2.

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.

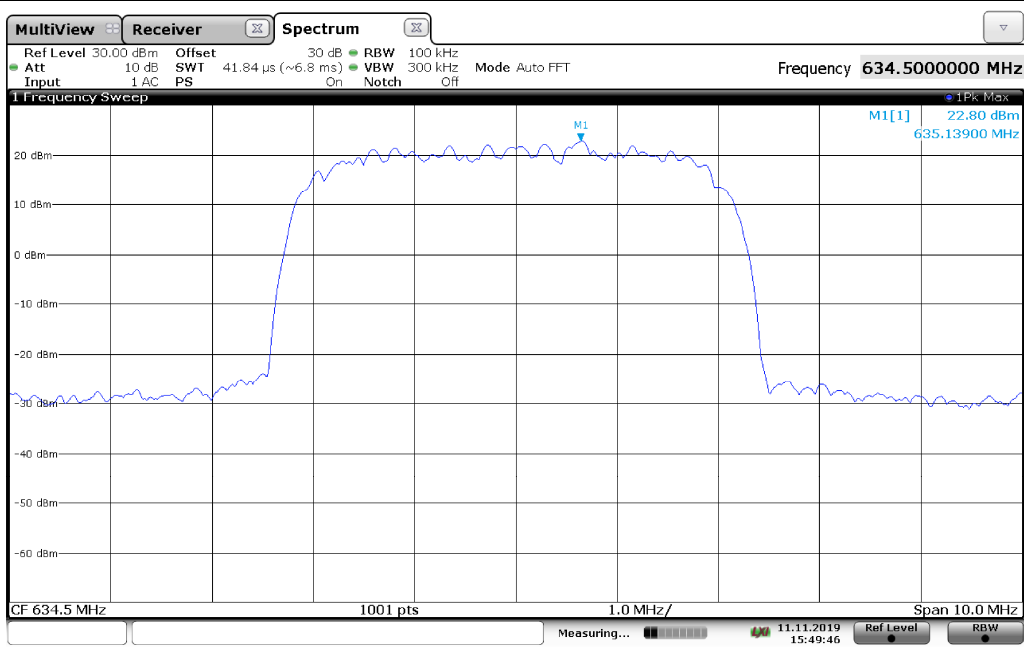
Test date: 2019-11-11

Test results: Pass

Special notes

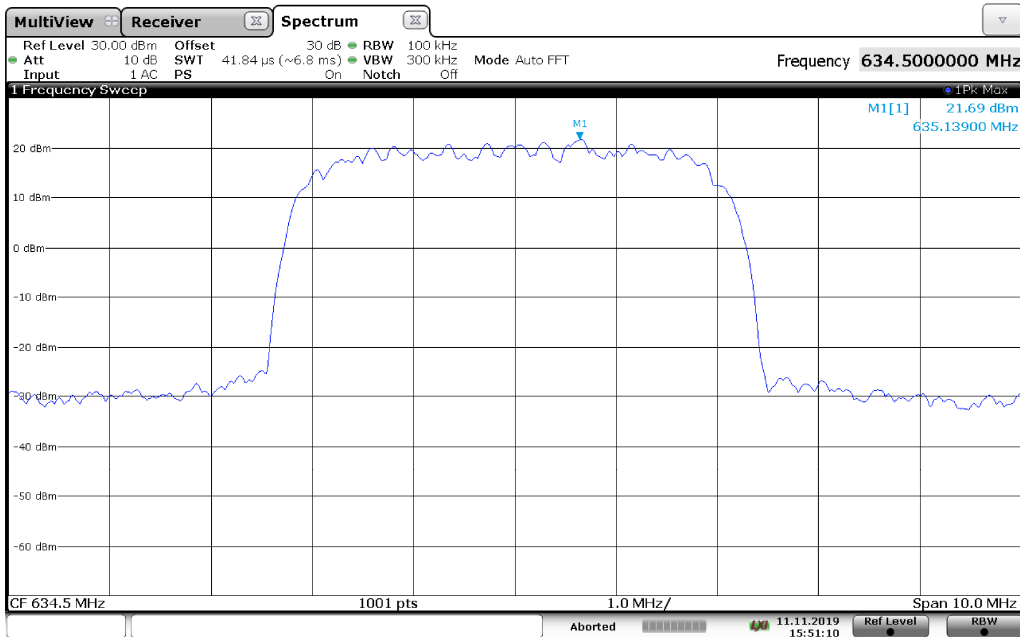
Signal stimulation: AWGN5
 Offset: 30 dB due to 30 dB physical attenuator

Test data



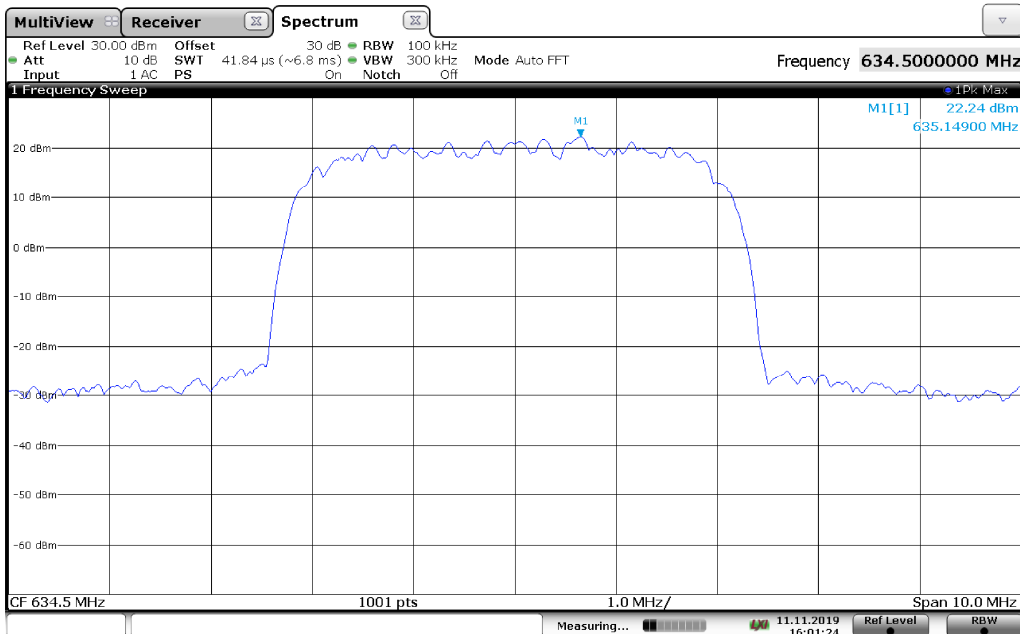
Output spectral plot with input at AGC threshold with AWGN5 signal at 634.5 MHz, Antenna 1

Test data

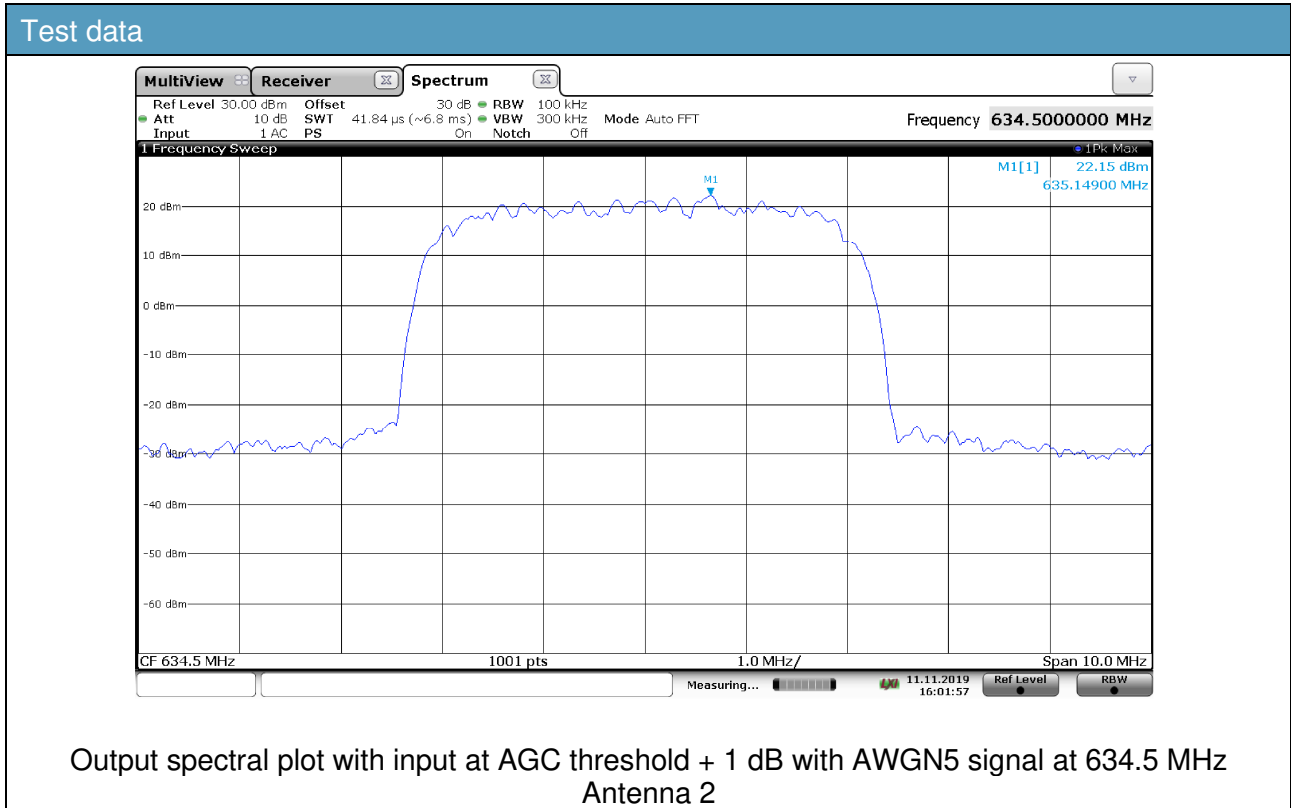


Output spectral plot with input at AGC threshold +1 dB with AWGN5 signal at 634.5 MHz, Antenna 1

Test data



Output spectral plot with input at AGC threshold with AWGN5 signal at 634.5 MHz Antenna 2



6.2 Out-of-band-rejection

Test performed according to KDB 935210 D05 Indus Booster Basic Meas v01r03 clause 3.3. 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: 2019-11-11

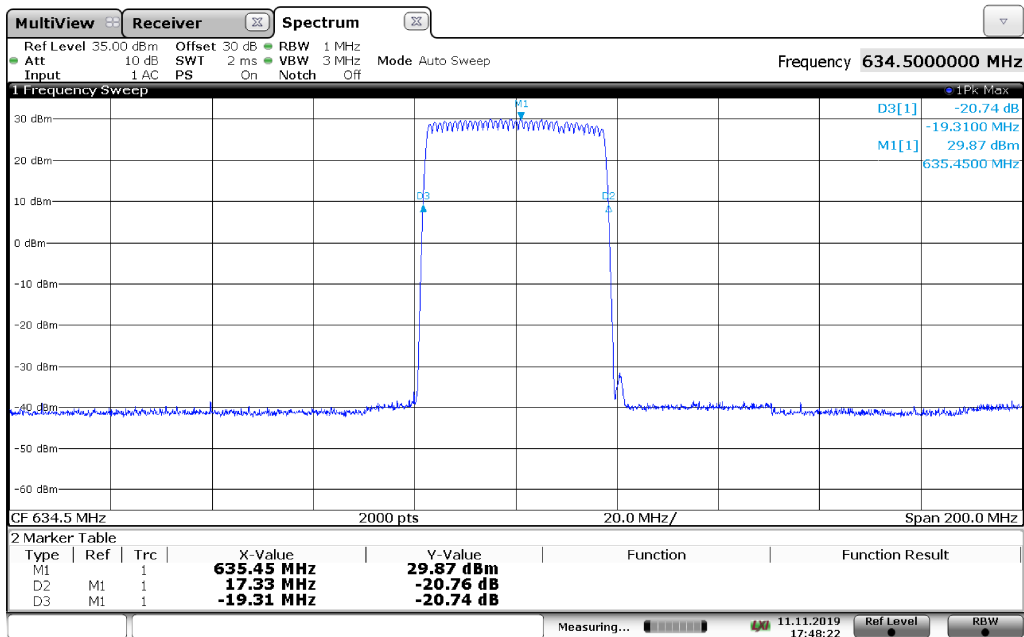
Test results: Pass

Special notes

Signal stimulation: CW

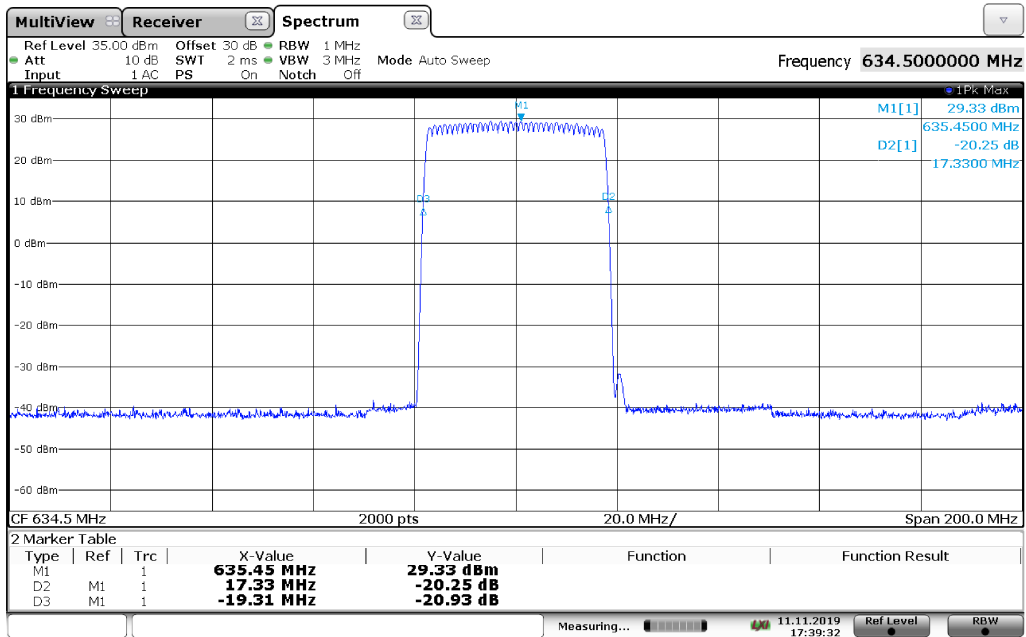
Offset: 30 dB due to 30 dB physical attenuator

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.

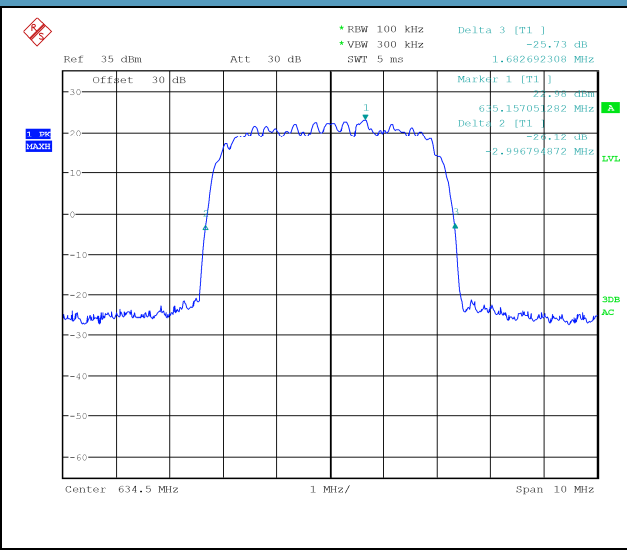
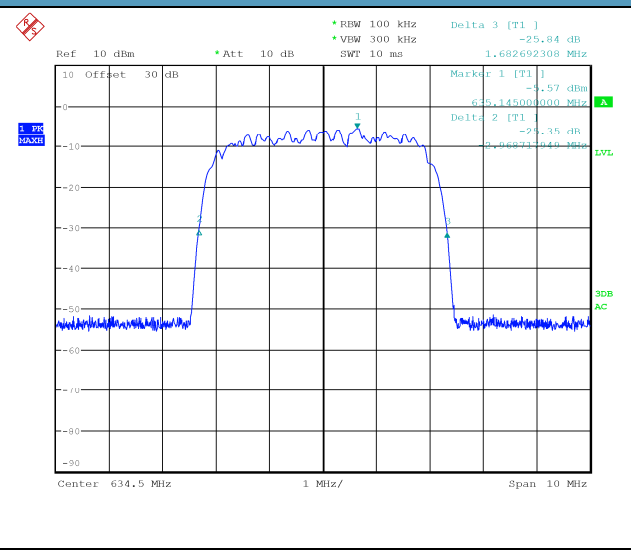
Test date: 2019-11-11

Test results: Pass

Special notes

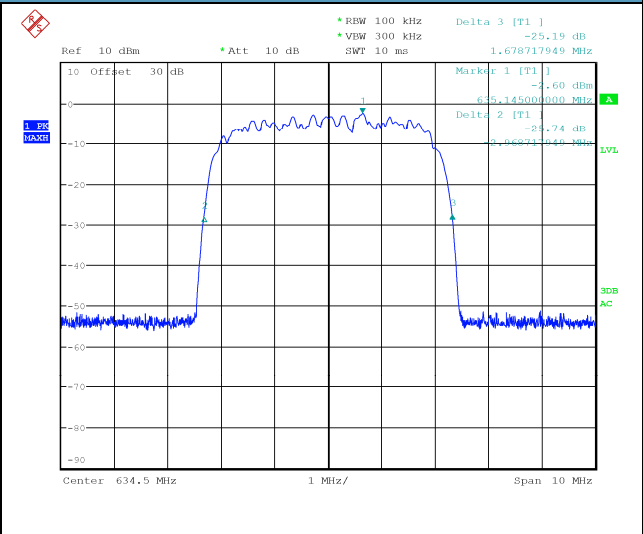
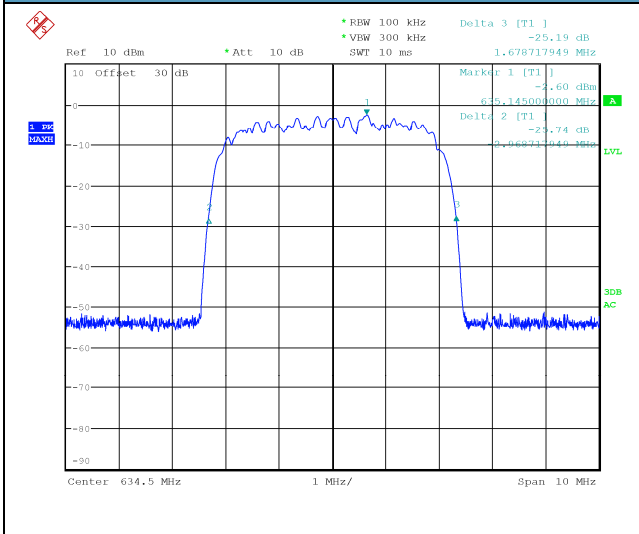
Signal stimulation: AWGN5
 Offset: 30 dB due to 30 dB physical attenuator

Test data



Input
Output Antenna 1
 26 dB bandwidth with input at AGC threshold at 634.5 MHz

Test data

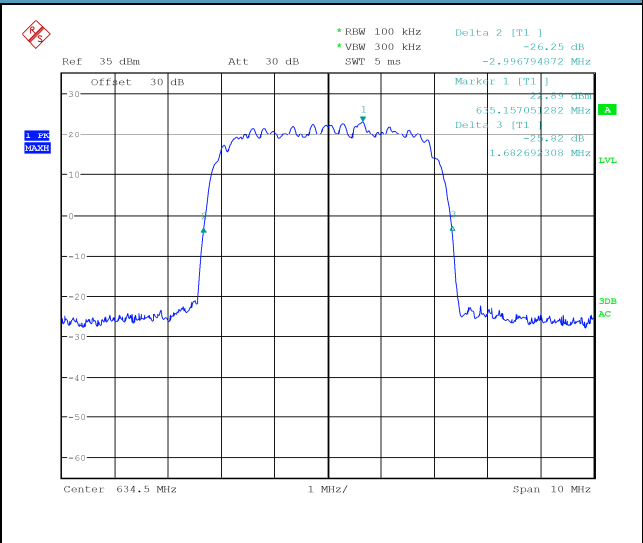
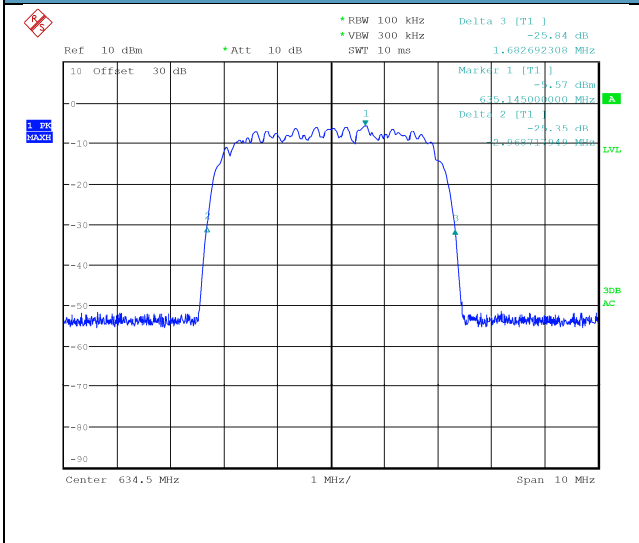


Input

Output Antenna 1

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

Test data

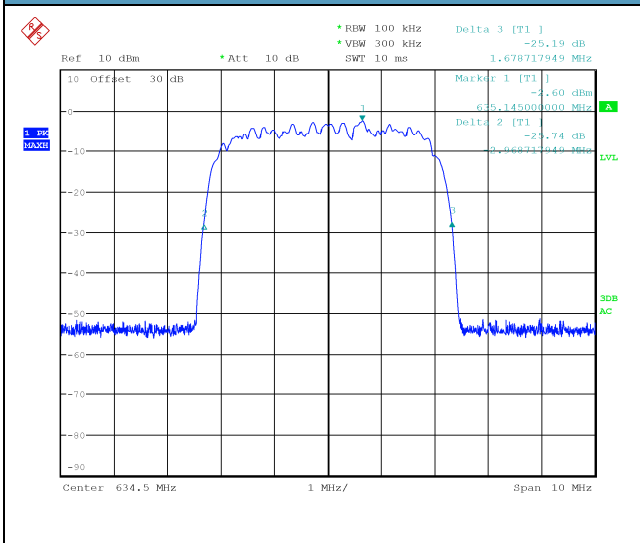


Input

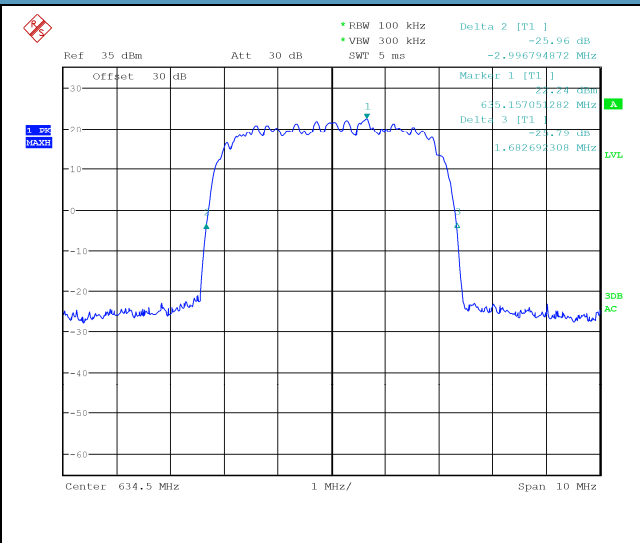
Output Antenna 2

26 dB bandwidth with input at AGC threshold at 634.5 MHz

Test data



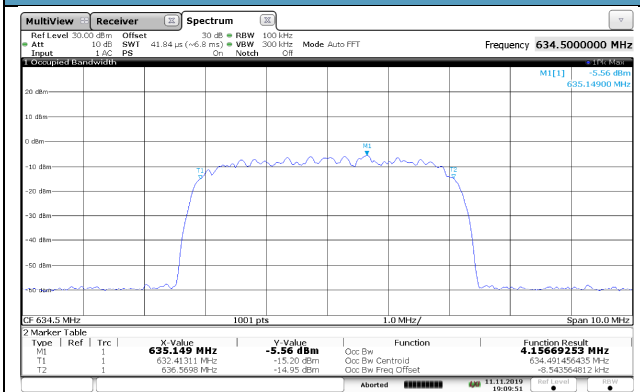
Input



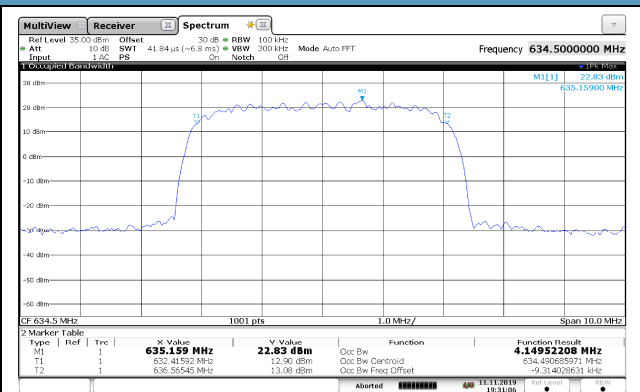
Output Antenna 2

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

Test data



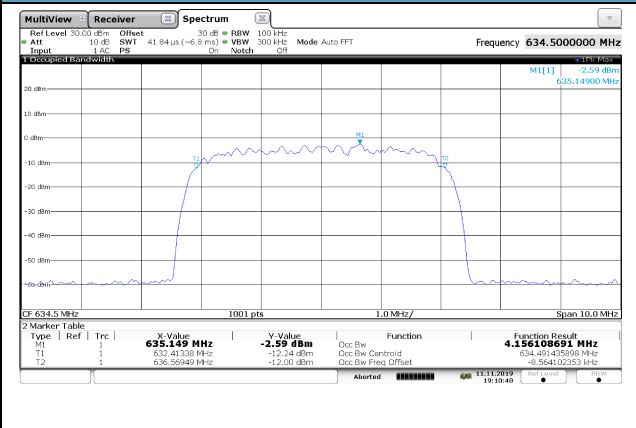
Input



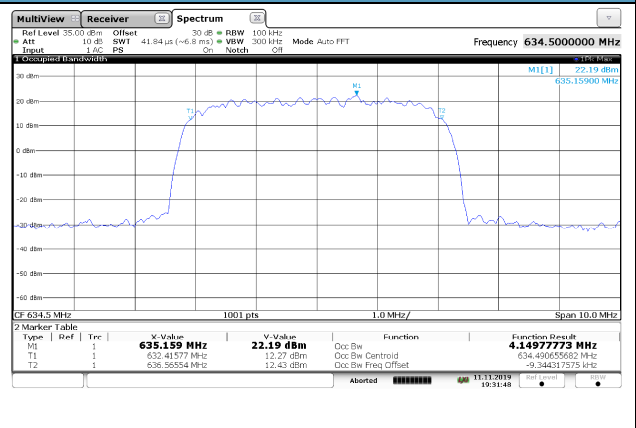
Output Antenna 1

99% occupied band with input at AGC threshold at 634.5 MHz

Test data



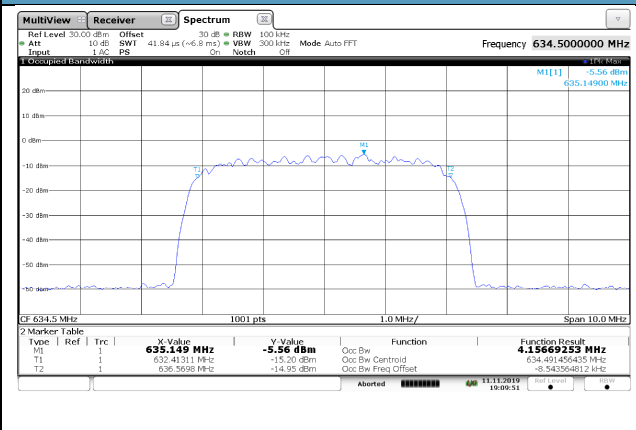
Input



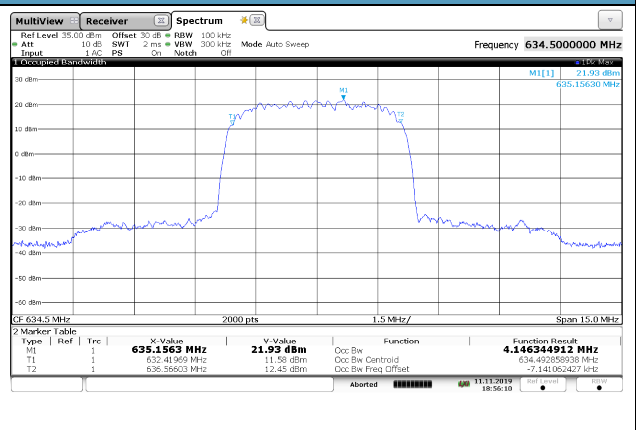
Output Antenna 1

99% occupied band input at AGC threshold +3dB at 634.5 MHz

Test data



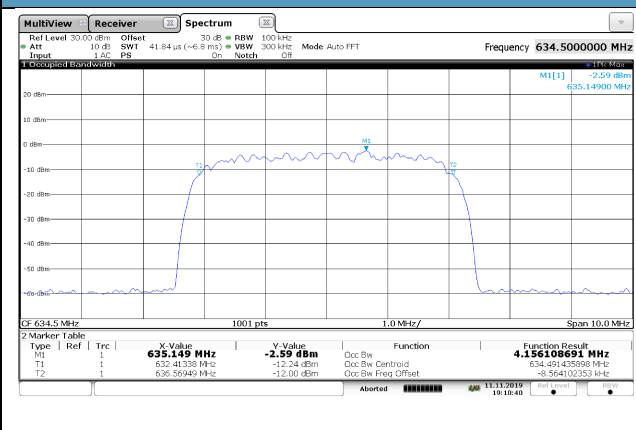
Input



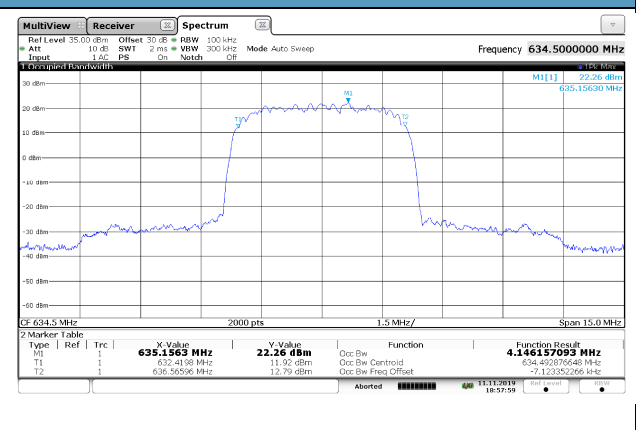
Output Antenna 2

99% occupied band with input at AGC threshold at 634.5 MHz

Test data



Input



Output Antenna 2

99% occupied band input at AGC threshold +3dB at 634.5 MHz

6.4 Input/output power and amplifier/booster gain

FCC 27.50(c)

The following power and antenna height requirements apply to stations transmitting in the 600 MHz band and the 698-746 MHz band:

- (1) Fixed and base stations transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (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 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 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 in 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 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, except for licensees operating in the 600 MHz downlink band, seeking to operate a fixed or base station 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 at an ERP greater than 1000 watts must:
 - Coordinate in advance with all licensees authorized to operate in the 698-758 MHz, 775-788, and 805-806 MHz bands within 120 kilometers (75 miles) of the base or fixed station;
 - (ii) coordinate in advance with all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.
- (6) Licensees of fixed or base stations transmitting a signal at an ERP greater than 1000 watts and greater than 1000 watts/MHz must comply with the provisions of paragraph (c)(8) of this section and §27.55(b), except that licensees of fixed or 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, must comply with the provisions of paragraph (c)(8) of this section and §27.55(b) only if transmitting a signal at an ERP greater than 2000 watts and greater than 2000 watts/MHz;
- (7) A licensee authorized to operate in the 710-716 or 740-746 MHz bands may operate a fixed or base station at an ERP up to a total of 50 kW within its authorized, 6 megahertz spectrum block if the licensee complies with the provisions of §27.55(b). The antenna height for such stations is limited only to the extent required to satisfy the requirements of §27.55(b).

- (8) Licensees intending to operate a base or fixed station at a power level permitted under the provisions of paragraph (c)(6) of this section must provide advanced notice of such operation to the Commission and to licensees authorized in their area of operation. Licensees who must be notified are all licensees authorized under this part to operate on an adjacent spectrum block within 75 km of the base or fixed station. Notifications must provide the location and operating parameters of the base or fixed station, including the station's ERP, antenna coordinates, antenna height above ground, and vertical antenna pattern, and such notifications must be provided at least 90 days prior to the commencement of station operation.
- (9) Control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.
- (10) Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.
- (11) Licensees may employ equipment operating in compliance with either the measurement techniques described in paragraph (b)(11) of this section or a Commission-approved average power technique. In both instances, equipment employed must be authorized in accordance with the provisions of §27.51.
- (12) A licensee authorized to operate in the 716-722 or 722-728 MHz bands may operate a fixed or base station at an ERP up to a total of 50 kW within its authorized, 6 megahertz spectrum block if the licensee complies with the provisions of §27.55(b), obtains written concurrences from all affected licensees in the 698-746 MHz bands within 120 km of the proposed high power site, and files a copy of each written concurrence with the Wireless Telecommunications Bureau on FCC Form 601. The antenna height for such stations is limited only to the extent required to satisfy the requirements of §27.55(b).
- (13) Licensees authorized to operate in the 716-722 or 722-728 MHz bands must coordinate with licensees with uplink operations in the 698-716 MHz band to mitigate the potential for harmful interference. Licensees authorized to operate in the 716-722 or 722-728 MHz bands must mitigate harmful interference to licensees' uplink operations in the 698-716 MHz band within 30 days after receiving written notice from the affected licensees. A licensee authorized to operate in the 716-722 or 722-728 MHz bands must ensure that 716-728 MHz band transmissions are filtered at least to the extent that the 716-728 MHz band transmissions are filtered in markets where the 716-728 MHz band licensee holds any license in the 698-716 band, as applicable. For purposes of coordination and mitigation measures in paragraphs (i) and (iii) below, network will be deemed "deployed" as of the date upon which the network is able to support a commercial mobile or data service. The coordination and mitigation measures should include, but are not limited to, the following:
 - If a licensee operating in the 698-716 and 728-746 MHz band deploys a network after the 716-722 or 722-728 MHz bands licensee deploys a network on its 716-722 or 722-728 MHz spectrum in the same geographic market, the 716-722 or 722-728 MHz bands licensee will work with the licensee with uplink operations in the 698-716 MHz band to identify sites that will require additional filtering, and will help the licensee operating in the 698-716 and 728-746 MHz bands to identify proper filters;
 - (ii) The 716-722 or 722-728 MHz bands licensee must permit licensees operating in the 698-716 and 728-746 MHz bands to collocate on the towers it owns at prevailing market rates; and
 - (iii) If a 698-716 and 728-746 MHz bands licensee deploys a network before a licensee in the 716-722 or 722-728 MHz bands deploys a network in the same geographic market, the 716-722 or 722-728 MHz bands licensee will work with licensees in the 698-716 and 728-746 MHz bands to identify sites that will need additional filtering and will purchase and pay for installation of required filters on such sites.

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-130 clause 4.6.1

The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

RSS-130 clause 4.6.2

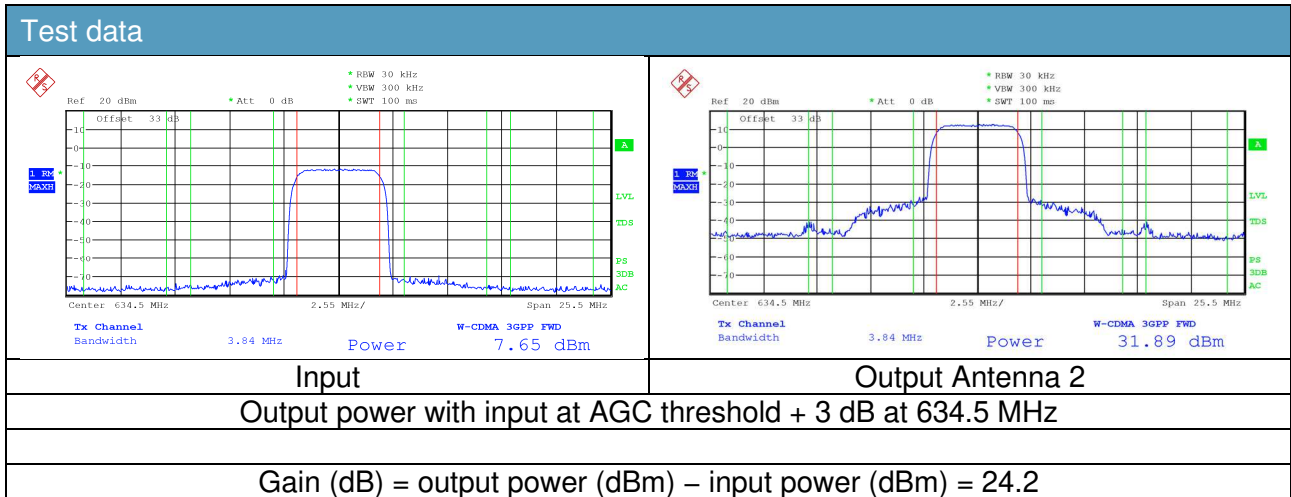
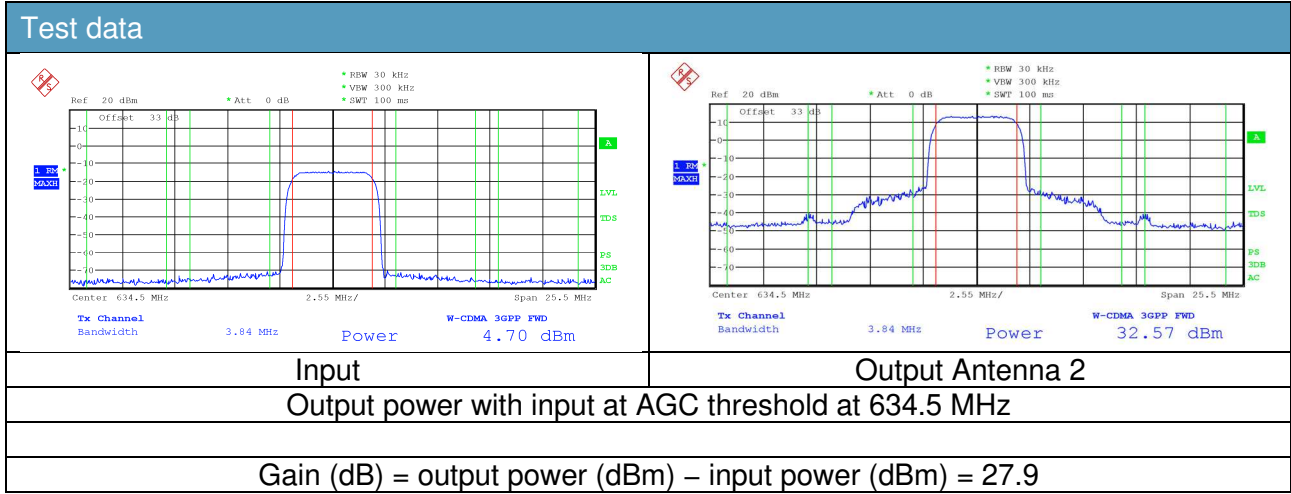
The e.r.p. shall not exceed 3 watts for mobile equipment, fixed subscriber equipment and portable equipment. For base and fixed equipment other than fixed subscriber equipment, refer to SRSP-518 for the equivalent isotropically radiated power (e.i.r.p.) limits.

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

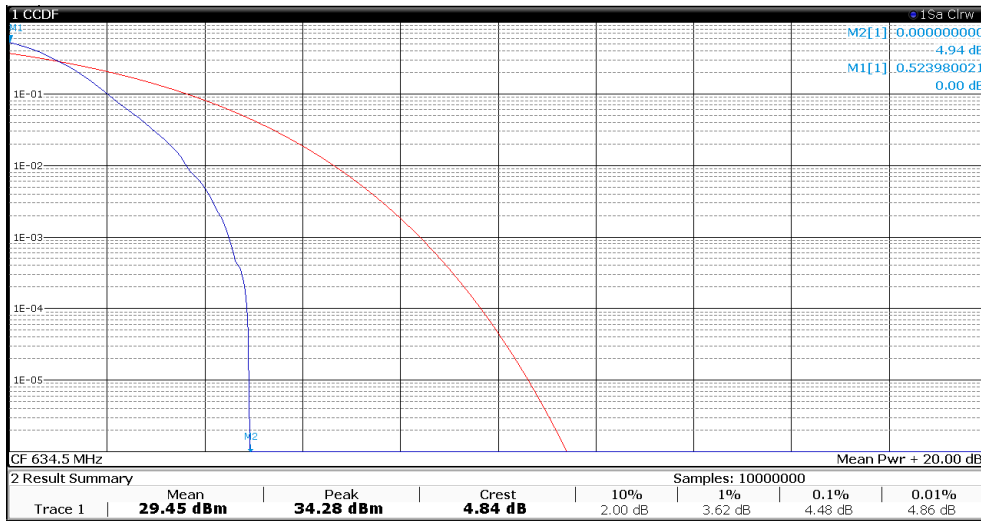
Special notes
Signal stimulation: AWGN5
Offset: 33 dB due to 30 dB physical attenuator and 3 dB (10log(N _{ANT})) due to KDB662911 Multiple Transmitter Output

Test data	
Input	Output Antenna 1
Output power with input at AGC threshold at 634.5 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 27.9	

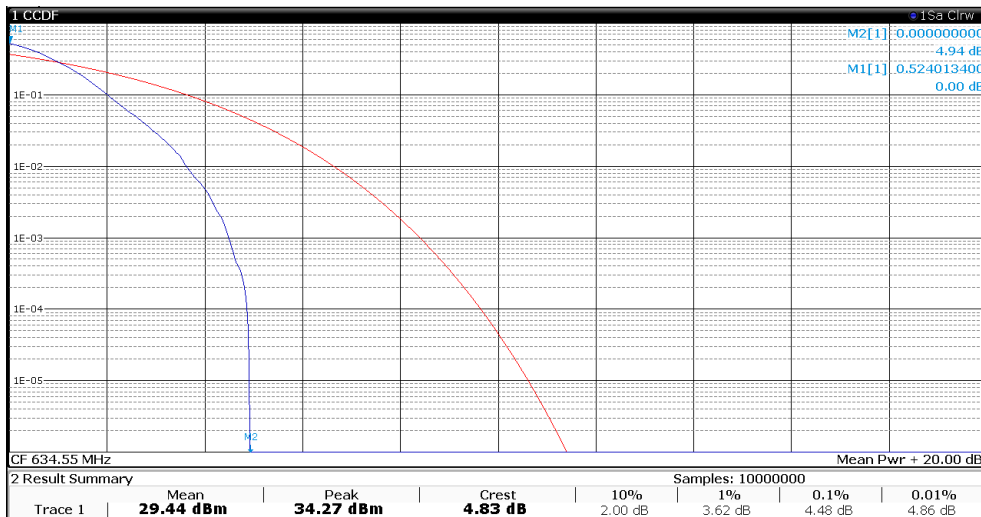
Test data	
Input	Output Antenna 1
Output power with input at AGC threshold + 3 dB at 634.5 MHz	
Gain (dB) = output power (dBm) – input power (dBm) = 24.3	



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

FCC 27.53 (g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

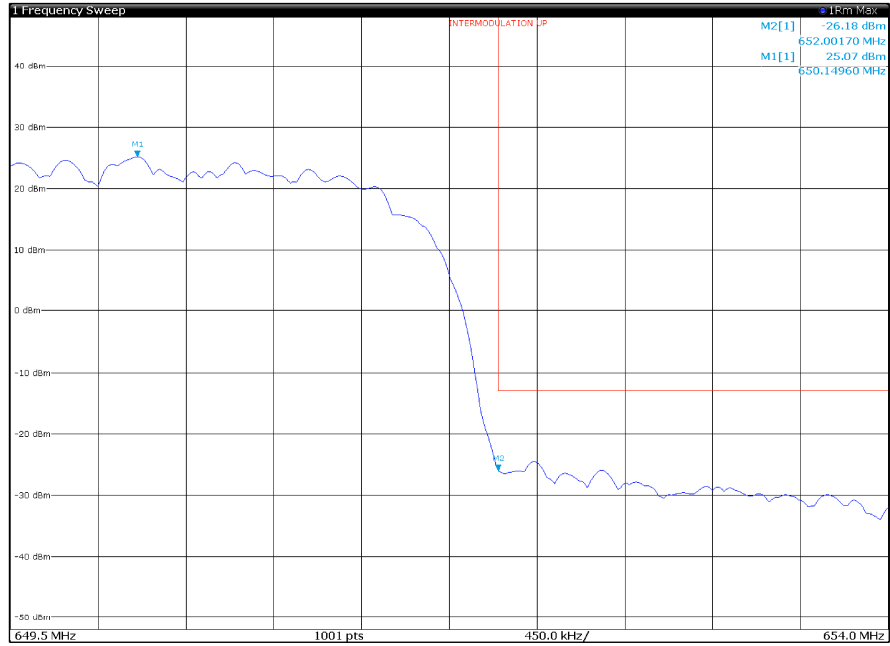
RSS-130 clause 4.7.1

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

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 (10log(N _{ANT})) due to KDB662911 Multiple Transmitter Output

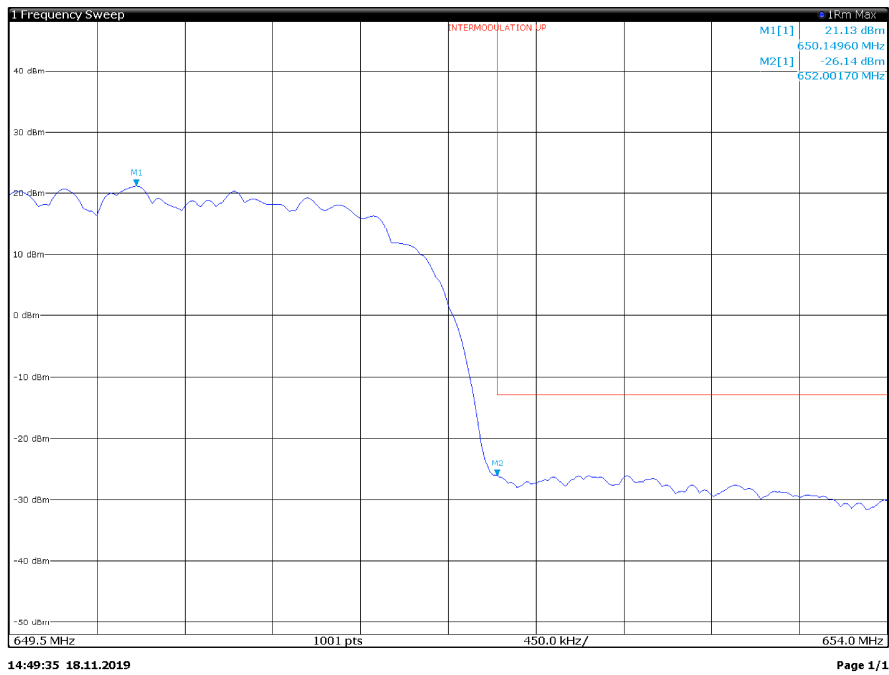
Test data



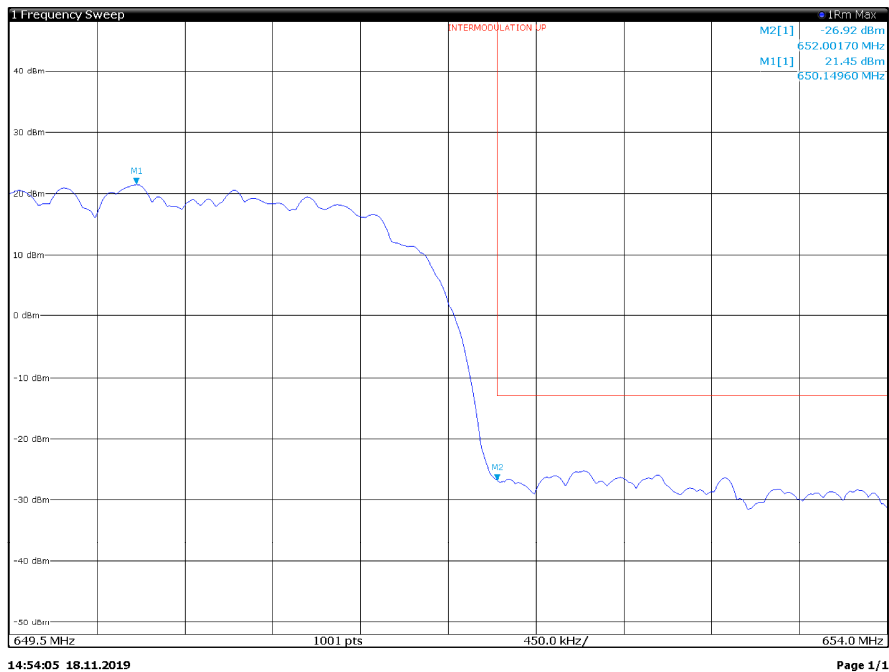
M2[1]	-26.18 dBm
	652.00170 MHz
M1[1]	25.07 dBm
	650.14960 MHz

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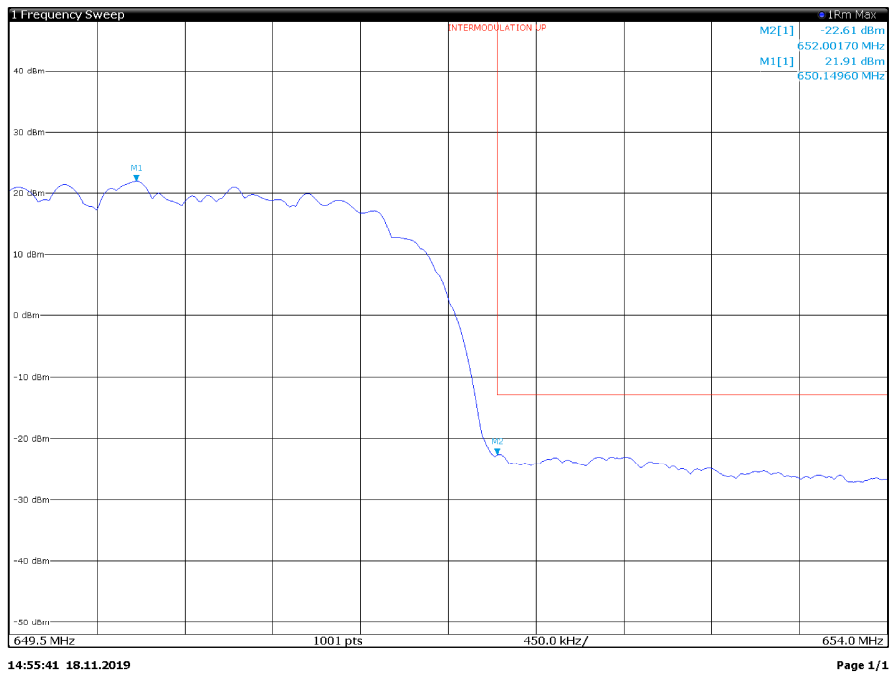
Upper block edge intermodulation products with input at AGC threshold, Antenna 1



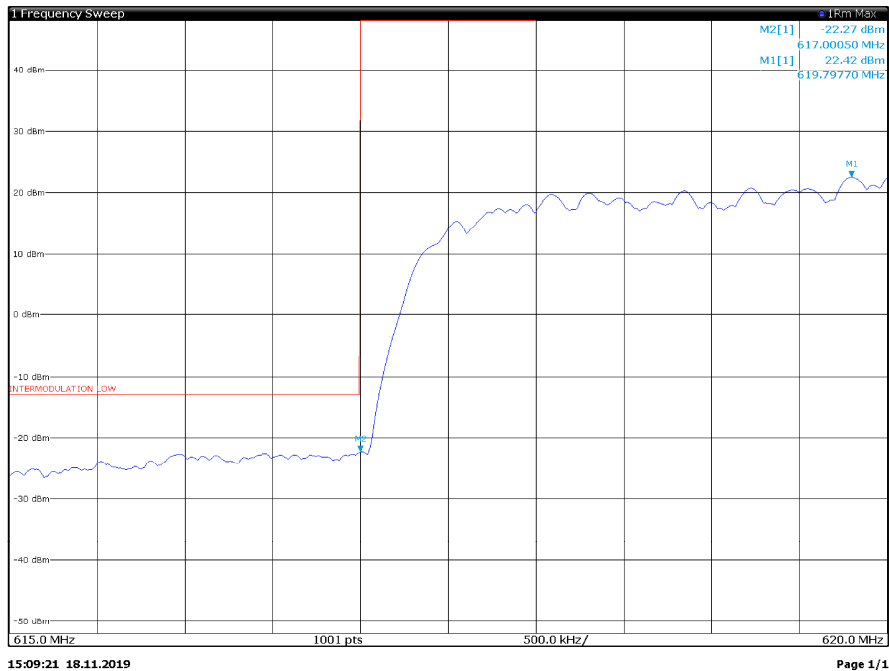
Upper block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 1



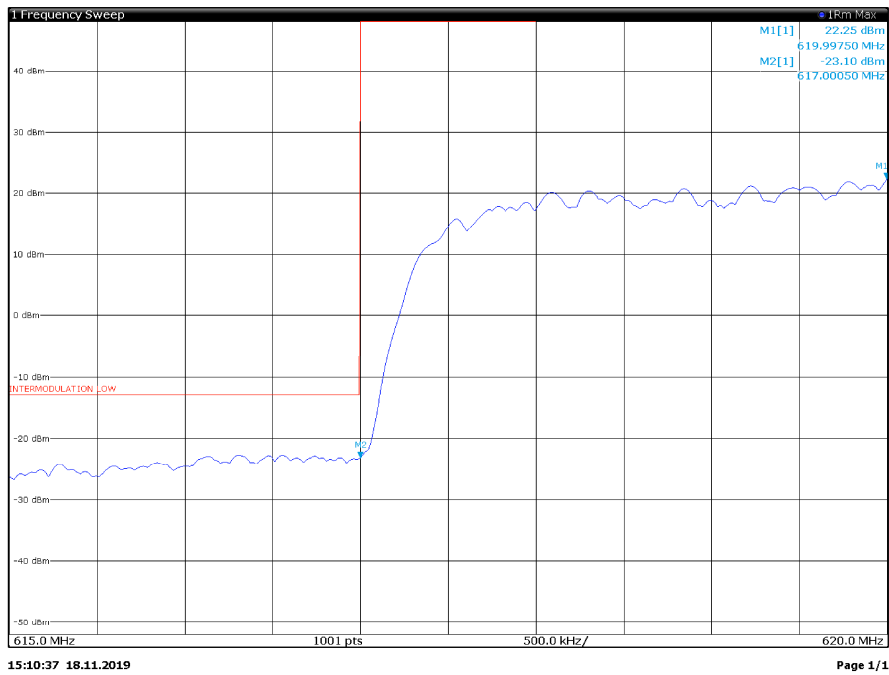
Upper block edge intermodulation products with input at AGC threshold, Antenna 2



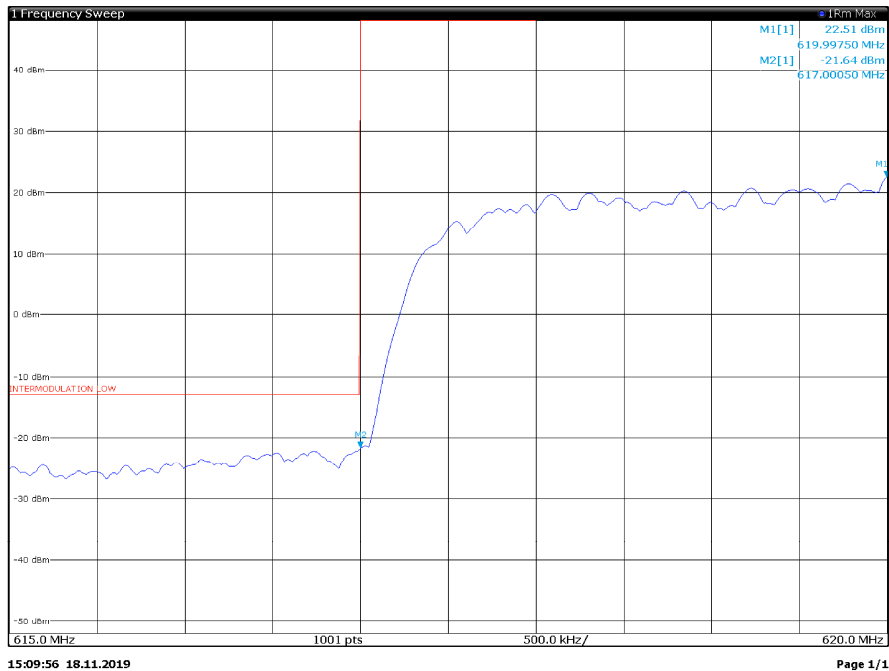
Upper block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 2



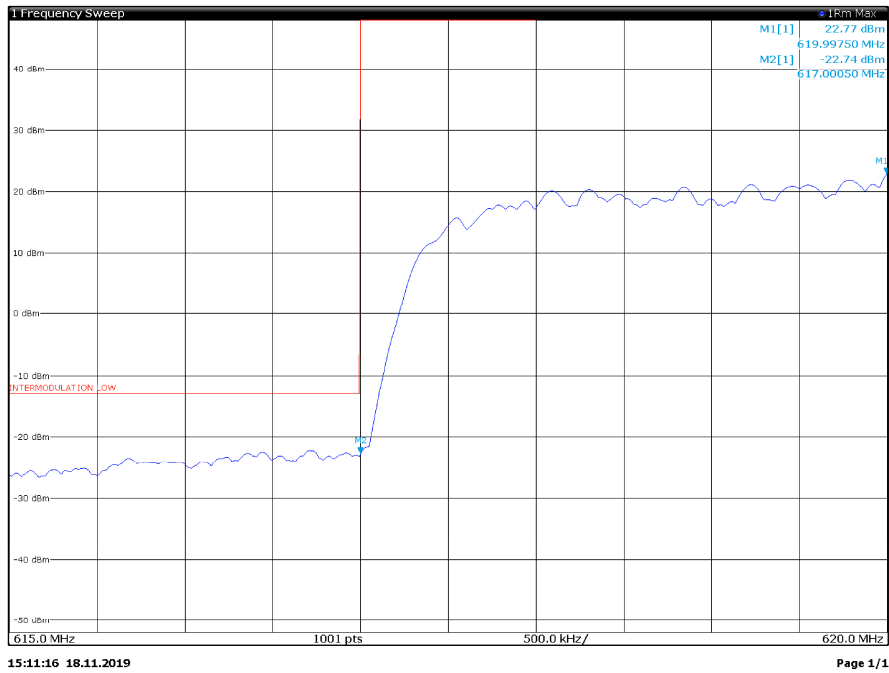
Lower block edge intermodulation products with input at AGC threshold, Antenna 1



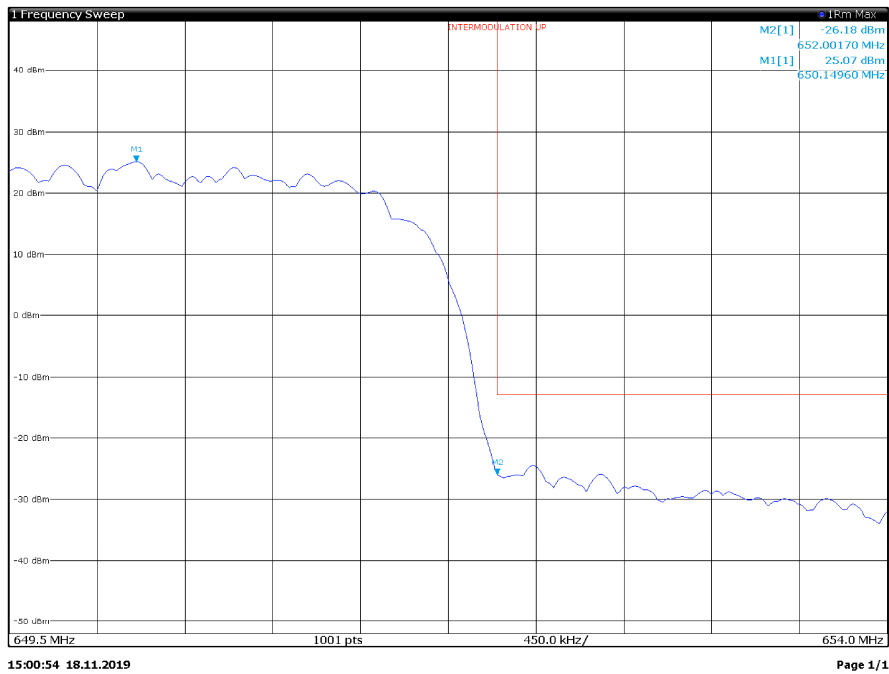
Lower block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 1



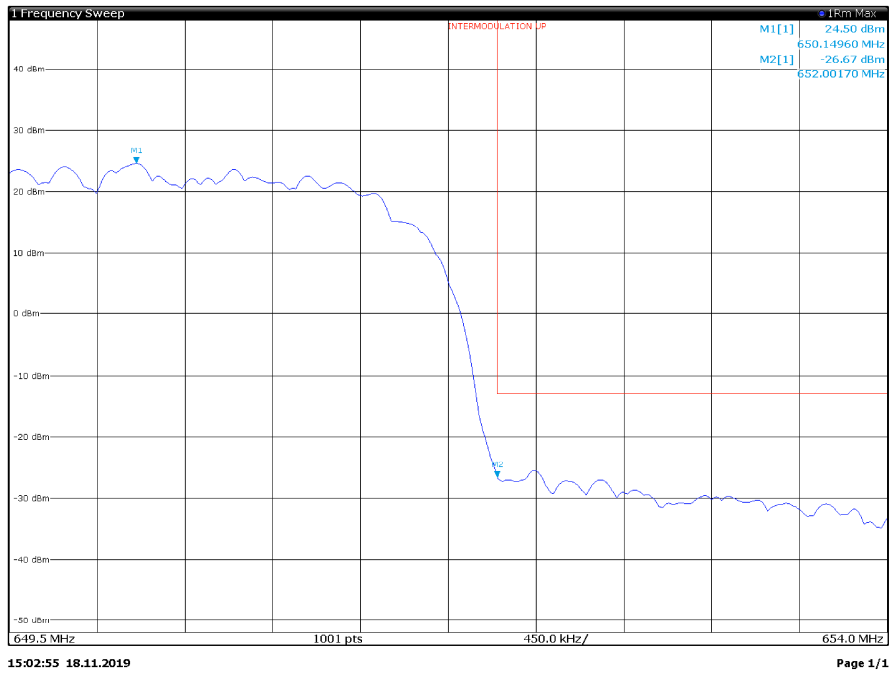
Lower block edge intermodulation products with input at AGC threshold, Antenna 2



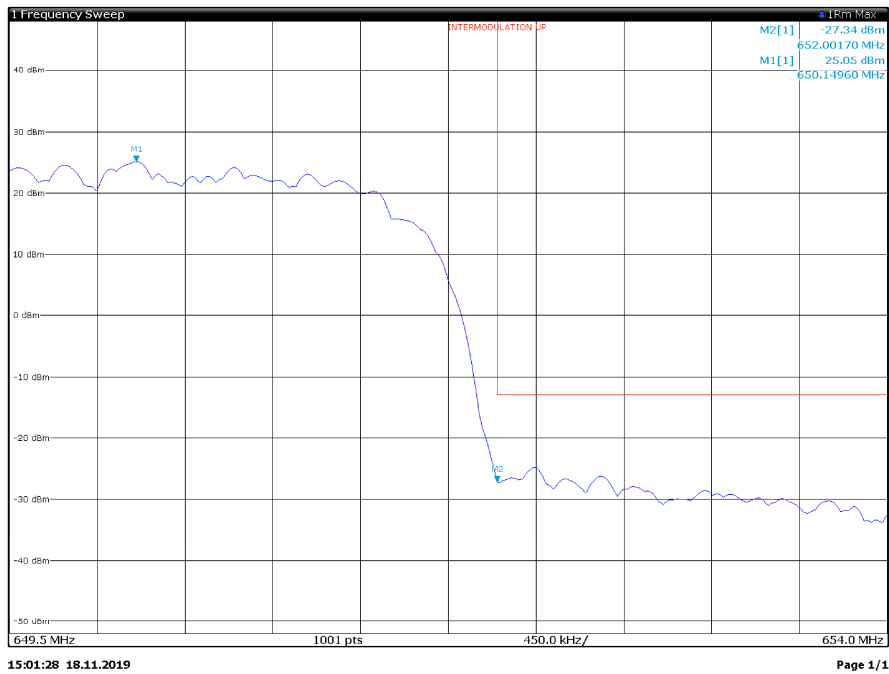
Lower block edge intermodulation products with input at AGC threshold + 3 dB, Antenna 2



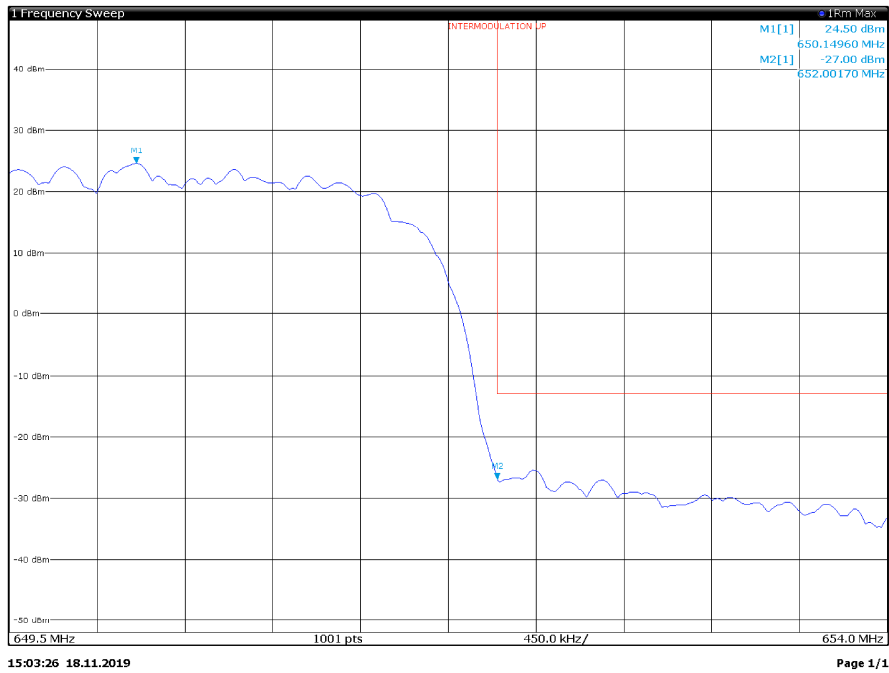
Upper block edge with input at AGC threshold, Antenna 1



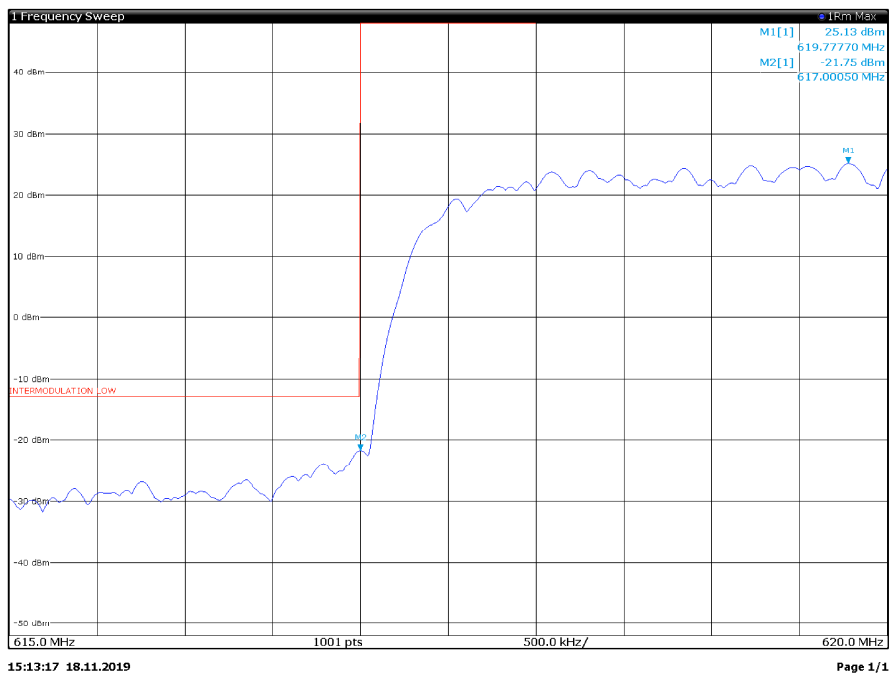
Upper block edge with input at AGC threshold + 3 dB, Antenna 1



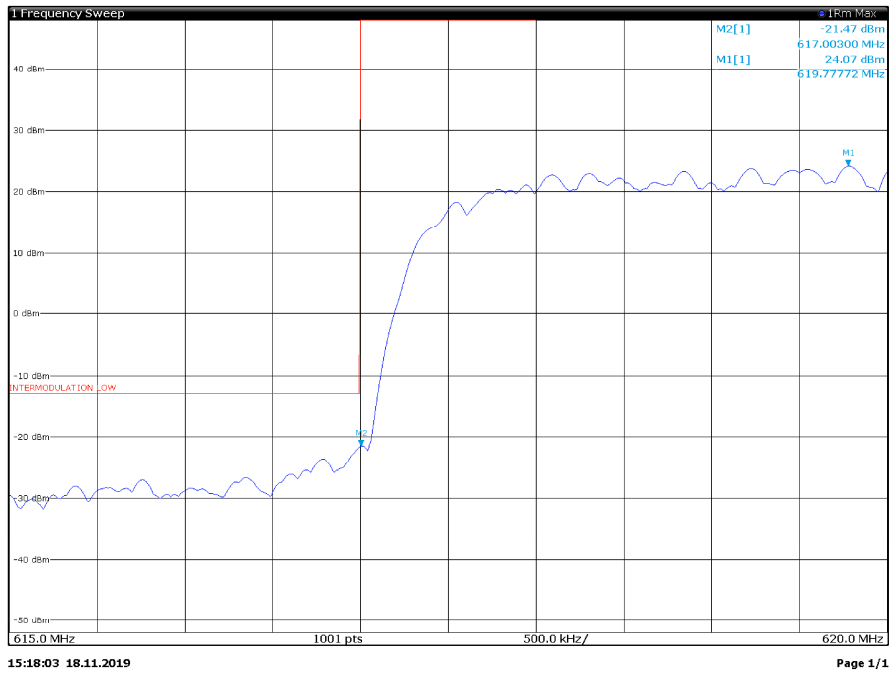
Upper block edge with input at AGC threshold, Antenna 2



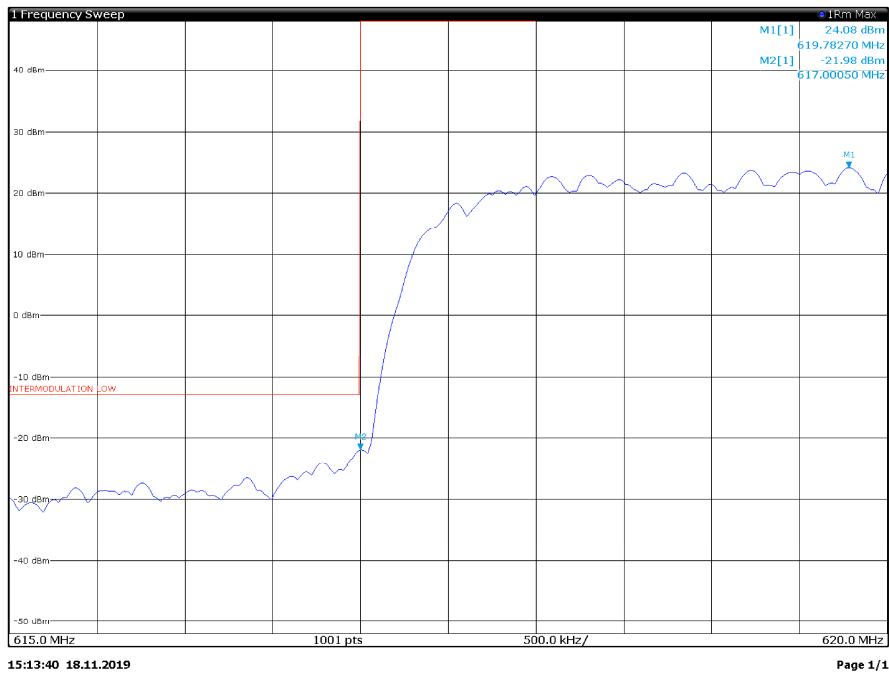
Upper block edge with input at AGC threshold + 3 dB, Antenna 2



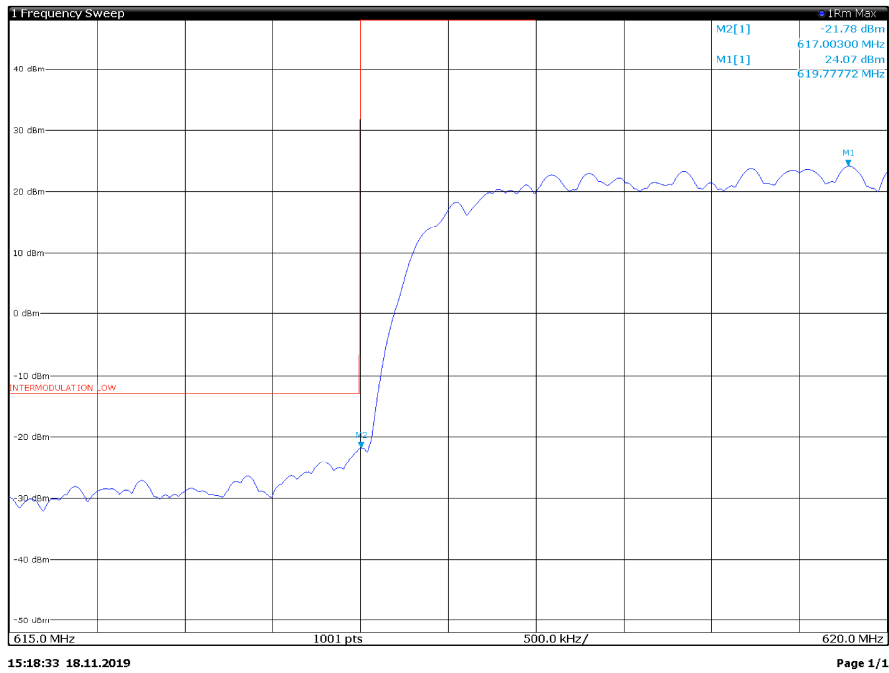
Lower block edge with input at AGC threshold, Antenna 1



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



Lower block edge with input at AGC threshold, Antenna 2



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

6.6 EUT spurious emissions conducted measurements

FCC 27.53 (g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

RSS-130 clause 4.7.1

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test date: 2019-06-19

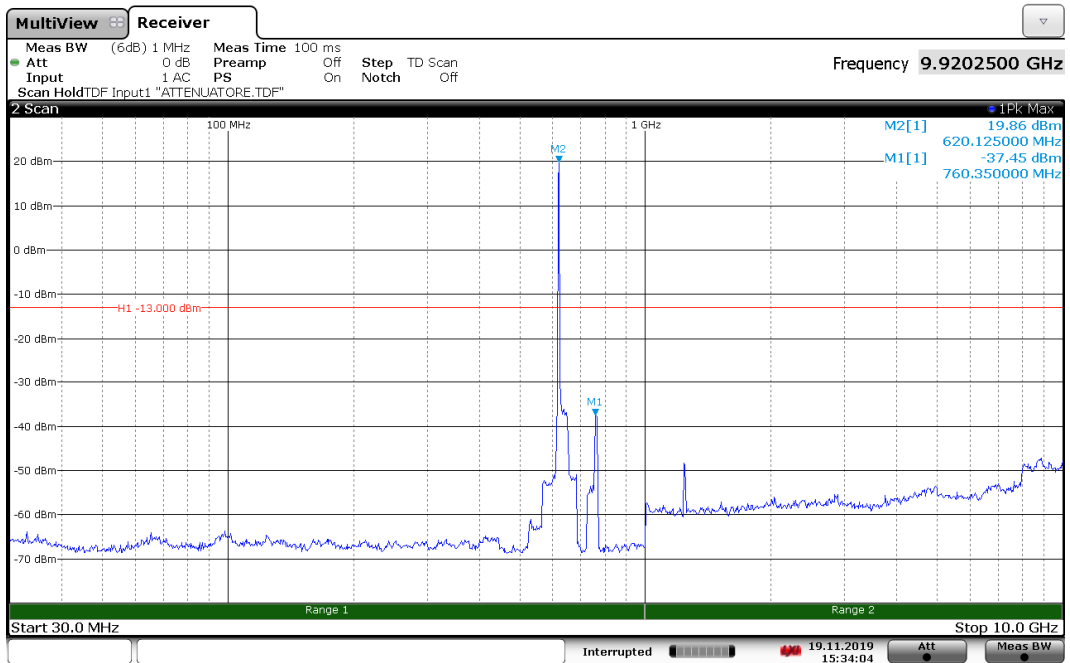
Test results: Pass

Special notes

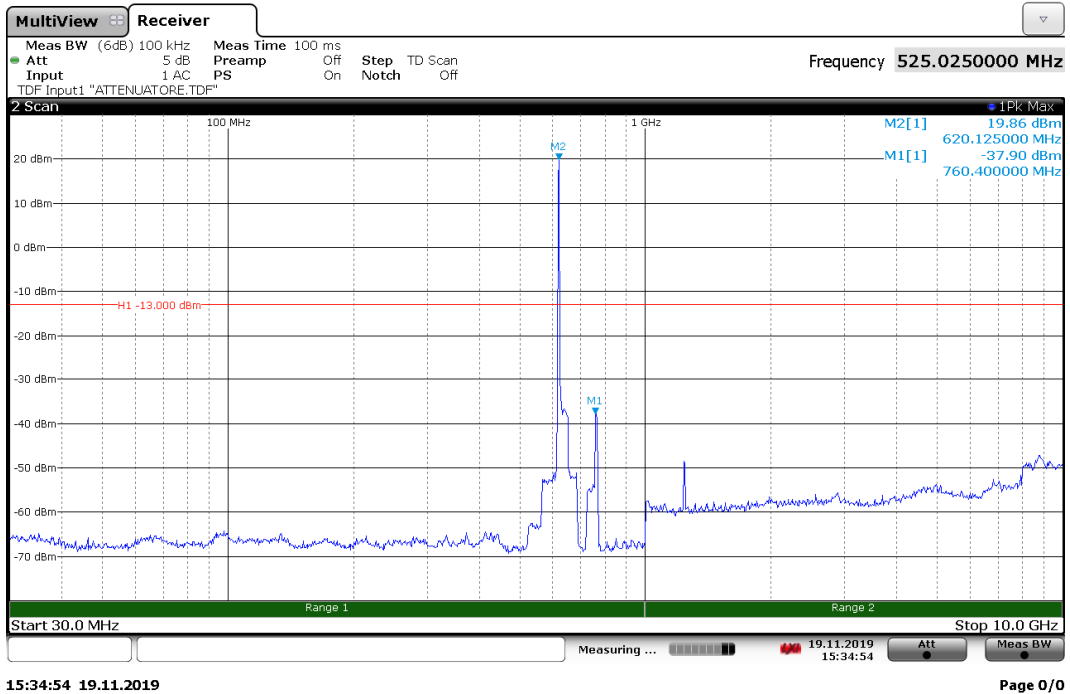
Signal stimulation: AWGN5

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

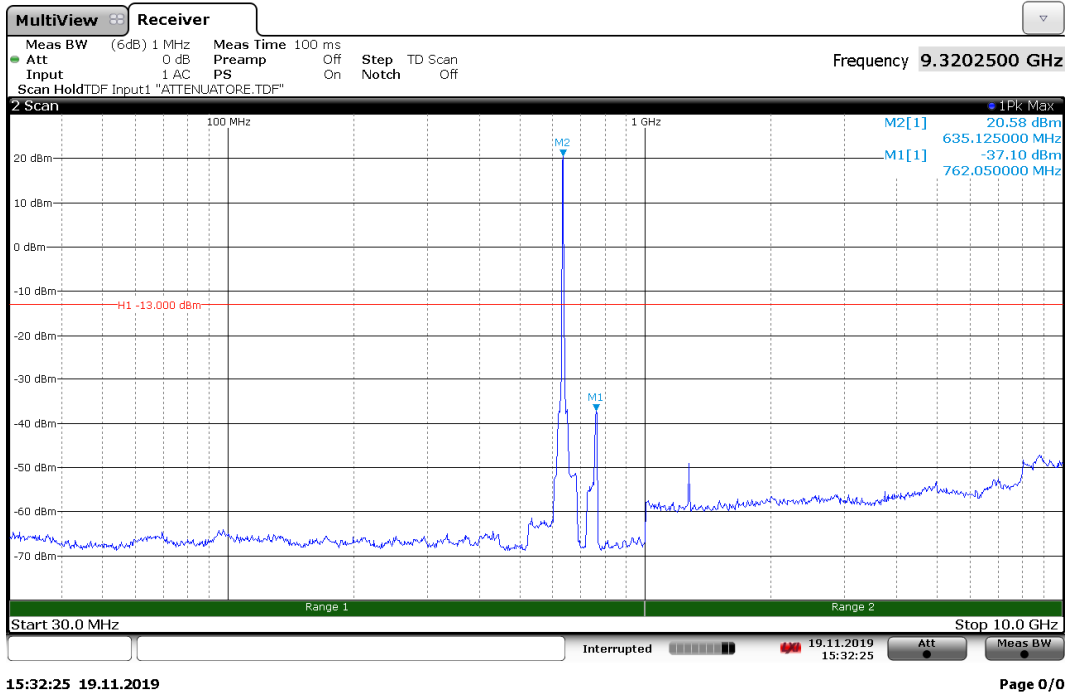
Test data



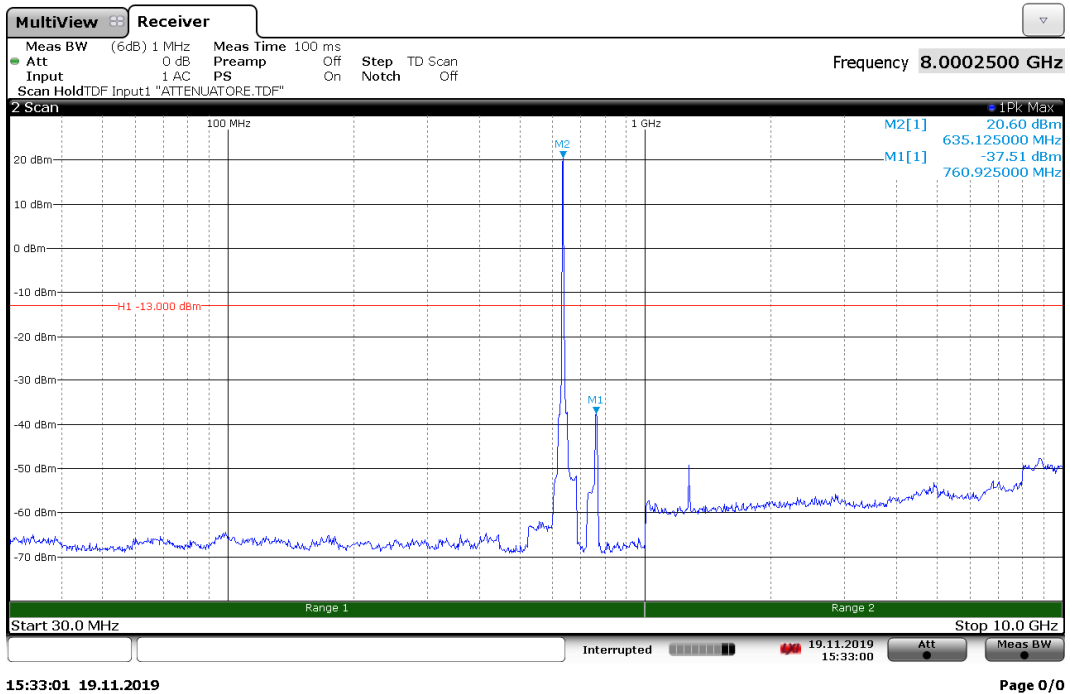
Spurious conducted emissions with input at AGC threshold at 619.5 MHz, Antenna 1



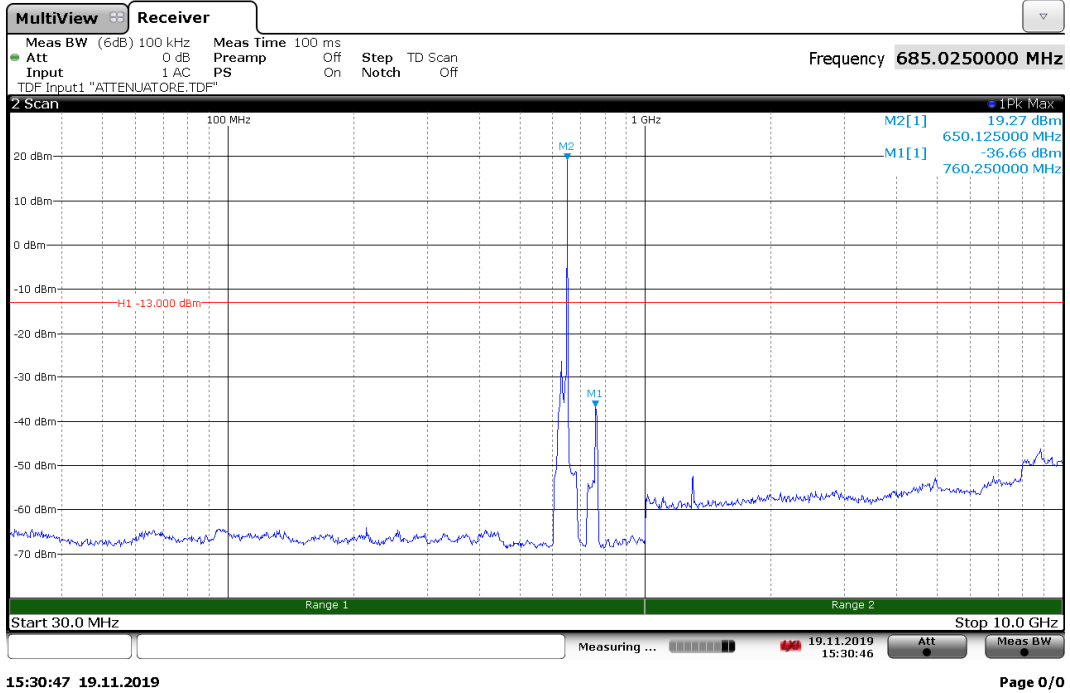
Spurious conducted emissions with input at AGC threshold at 760.5 MHz, Antenna 2



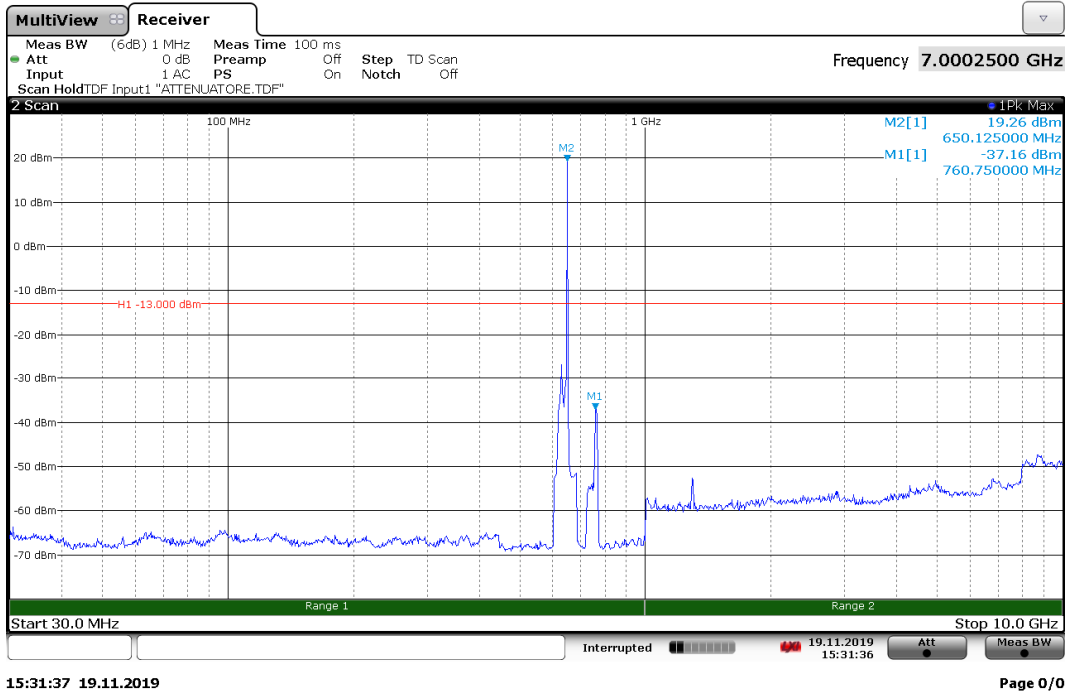
Spurious conducted emissions with input at AGC threshold at 634.5 MHz, Antenna 1



Spurious conducted emissions with input at AGC threshold at 634.5 MHz, Antenna 2



Spurious conducted emissions with input at AGC threshold at 649.5 MHz, Antenna 1



Spurious conducted emissions with input at AGC threshold at 649.5 MHz, Antenna 2

6.7 Frequency stability measurements

FCC 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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-130 clause 4.5

For equipment that is capable of transmitting numerous channels simultaneously for different applications (e.g. LTE and narrowband – internet of things (IoT)), the occupied bandwidth shall be the bandwidth representing the sum of the occupied bandwidths of these channels.

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range 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

Test data Antenna 1			
Test conditions	Frequency, GHz	Drift, Hz	ppm
+50 °C, Nominal	634 499 978	-10	-0.02
+40 °C, Nominal	634 499 975	-7	-0.01
+30 °C, Nominal	634 499 973	-5	-0.01
+20 °C, +15 %	634 499 968	0	0.00
+20 °C, Nominal	634 499 968	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	634 499 968	0	0.00
+10 °C, Nominal	634 499 963	5	0.01
0 °C, Nominal	634 499 961	7	0.01
-10 °C, Nominal	634 499 959	9	0.01
-20 °C, Nominal	634 499 940	28	0.04
-30 °C, Nominal	634 499 924	44	0.07

Test data Antenna 2			
Test conditions	Frequency, GHz	Drift, Hz	ppm
+50 °C, Nominal	634 499 979	-10	-0.02
+40 °C, Nominal	634 499 976	-7	-0.01
+30 °C, Nominal	634 499 974	-5	-0.01
+20 °C, +15 %	634 499 969	0	0.00
+20 °C, Nominal	634 499 969	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	634 499 969	0	0.00
+10 °C, Nominal	634 499 962	7	0.01
0 °C, Nominal	634 499 960	9	0.01
-10 °C, Nominal	634 499 958	11	0.02
-20 °C, Nominal	634 499 941	28	0.04
-30 °C, Nominal	634 499 925	44	0.07

6.8 Spurious emissions radiated measurements

FCC 27.53 (g)

For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

RSS-130 clause 4.7.1

The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

Test date: 2019-11-11

Test results: Pass

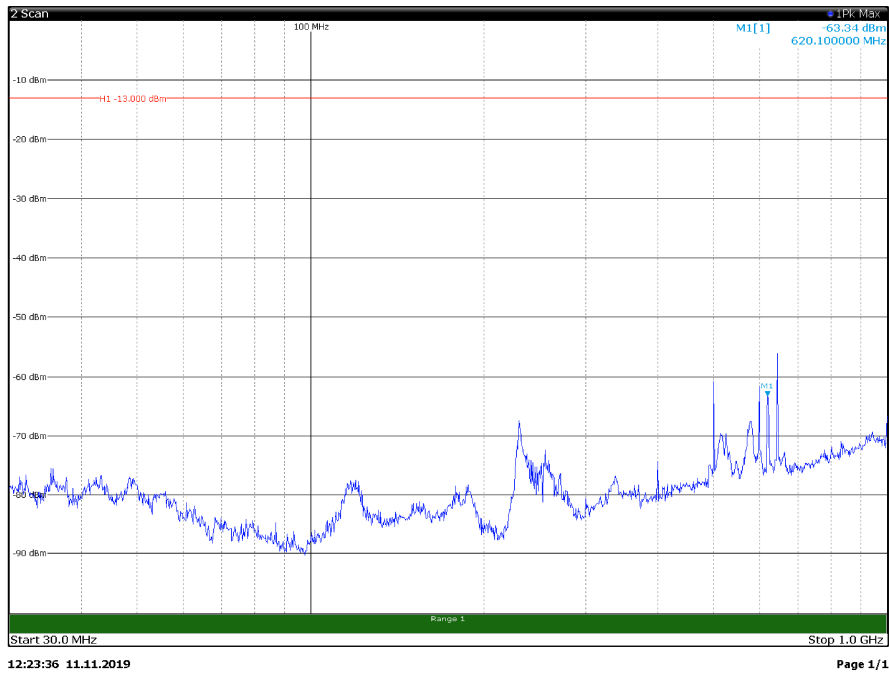
Special notes

Signal stimulation: AWGN5.

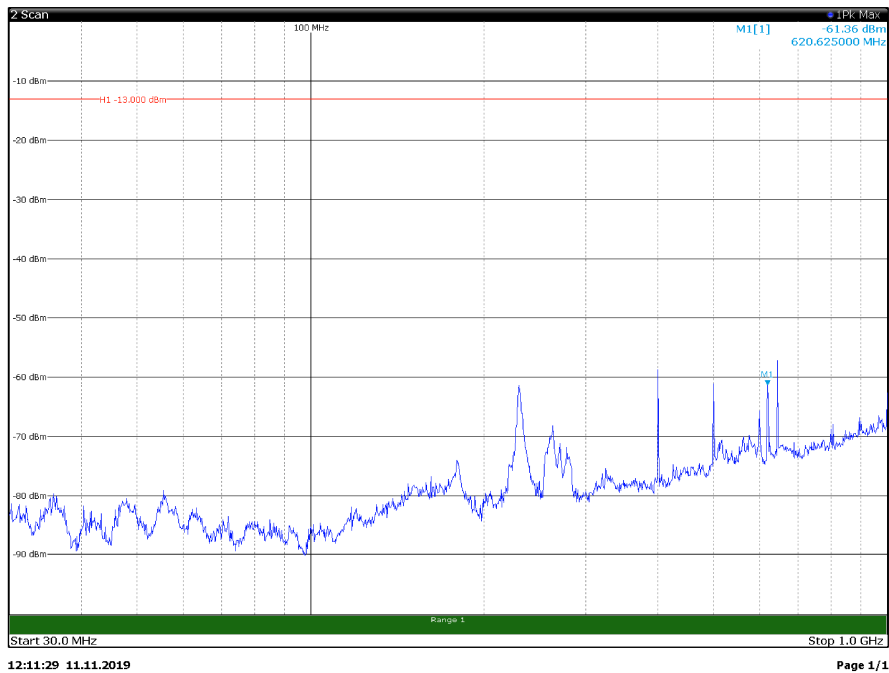
Test data

Spurious radiated emissions 30 MHz to 1 GHz

Spurious radiated emissions with input at AGC threshold at 619.5 MHz

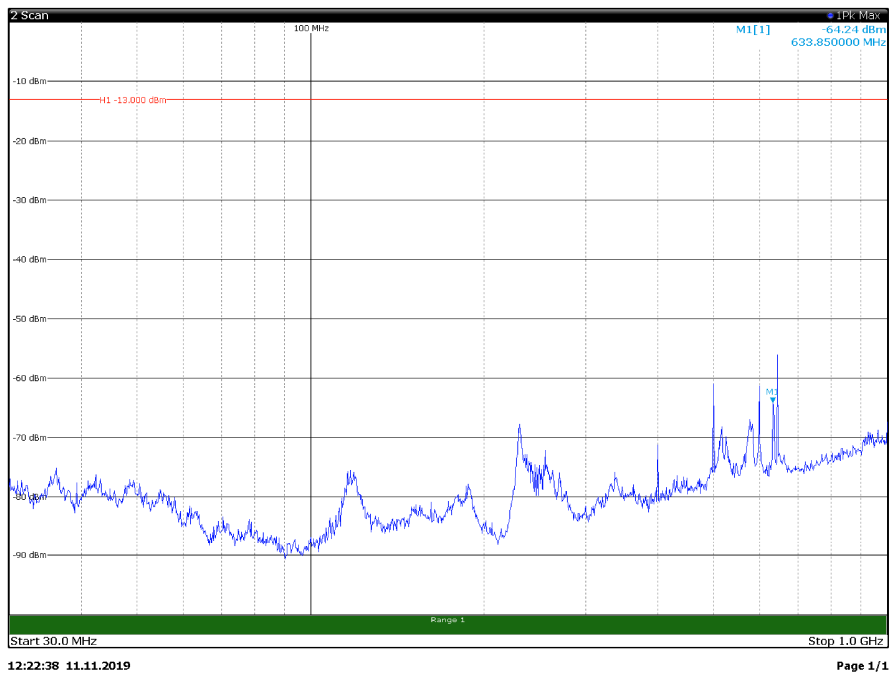


Horizontal polarization

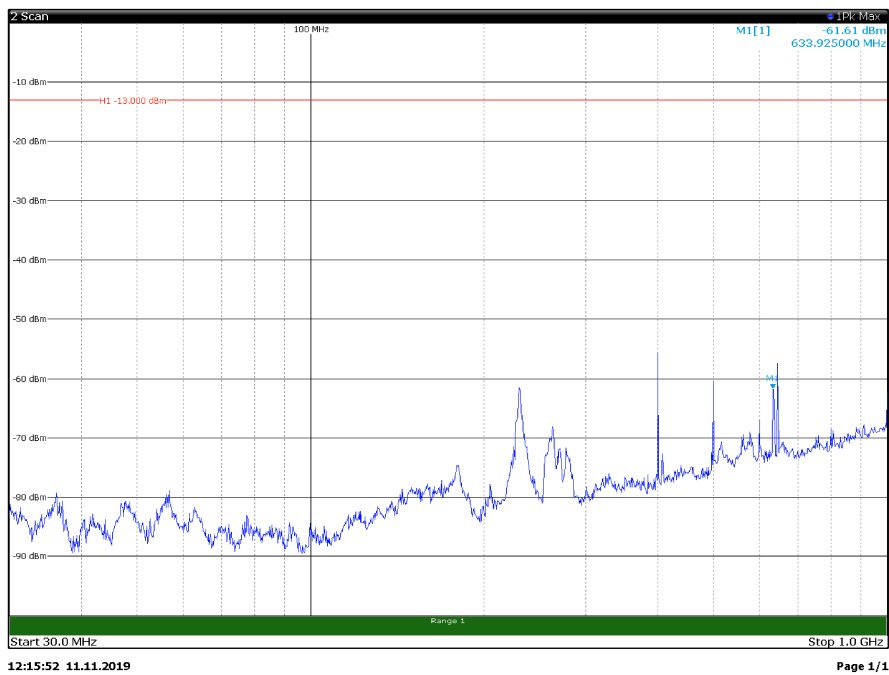


Vertical polarization

Spurious radiated emissions with input at AGC threshold at 634.5 MHz

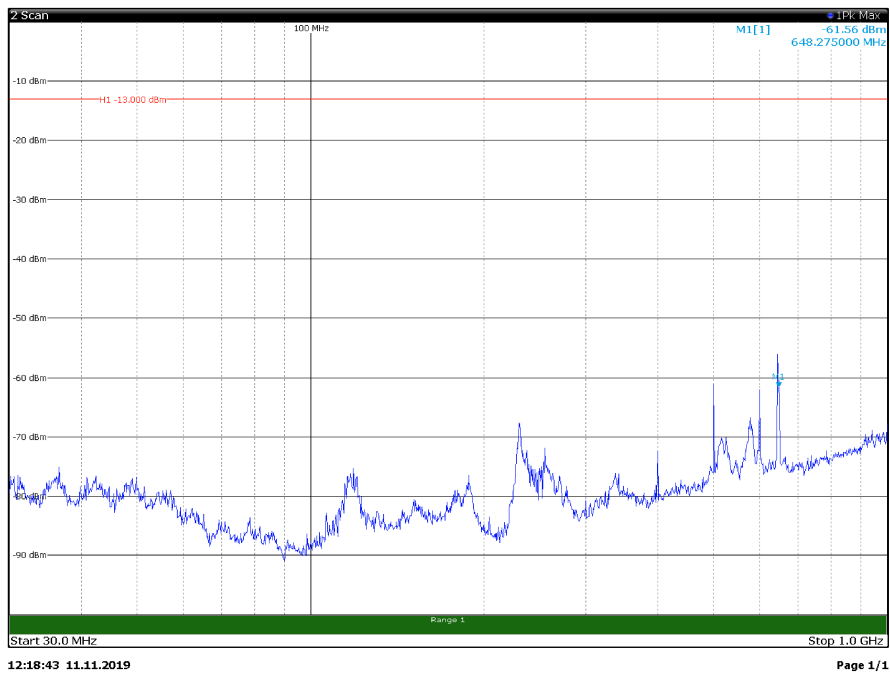


Horizontal polarization

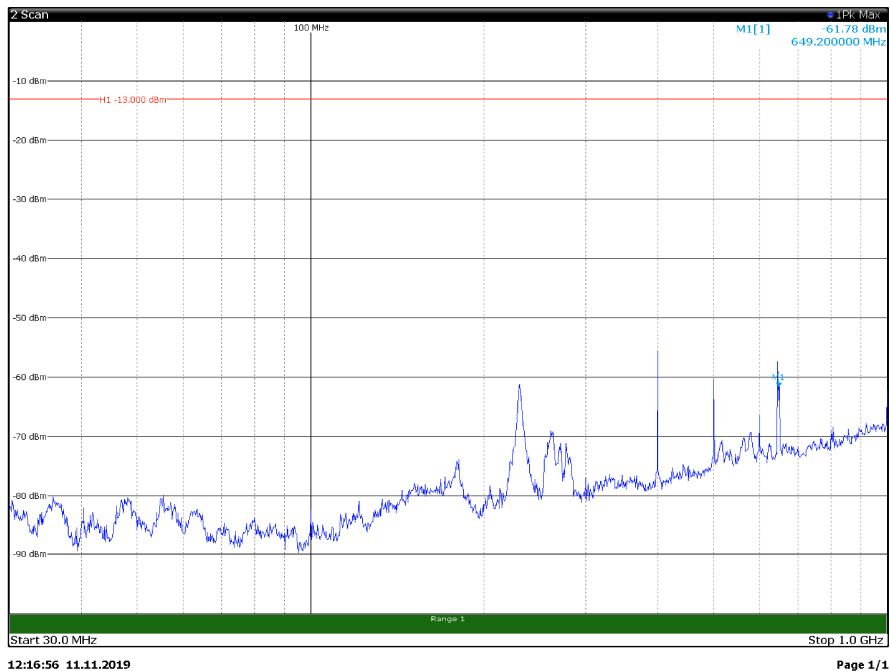


Vertical polarization

Spurious radiated emissions with input at AGC threshold at 649.5 MHz



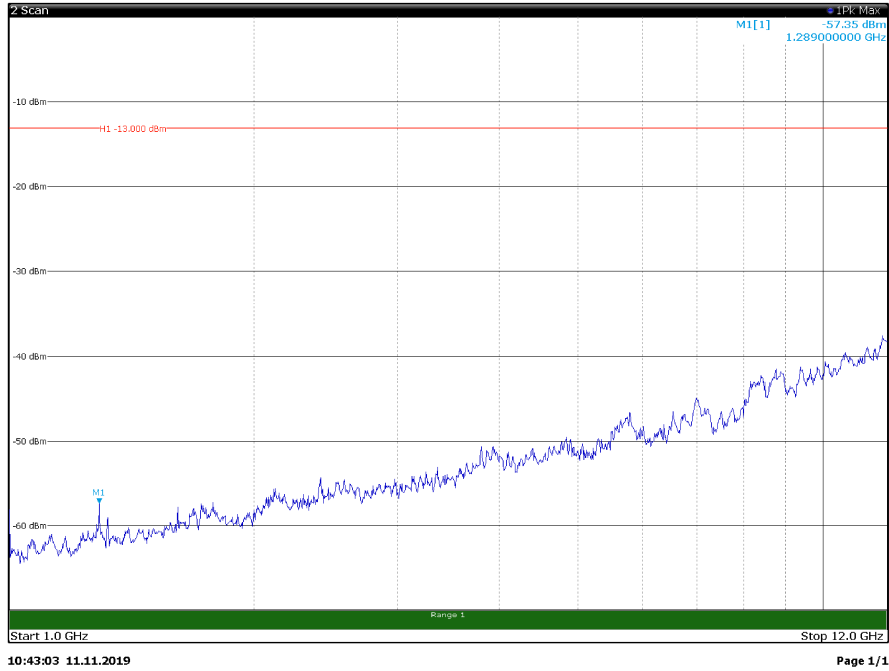
Horizontal polarization



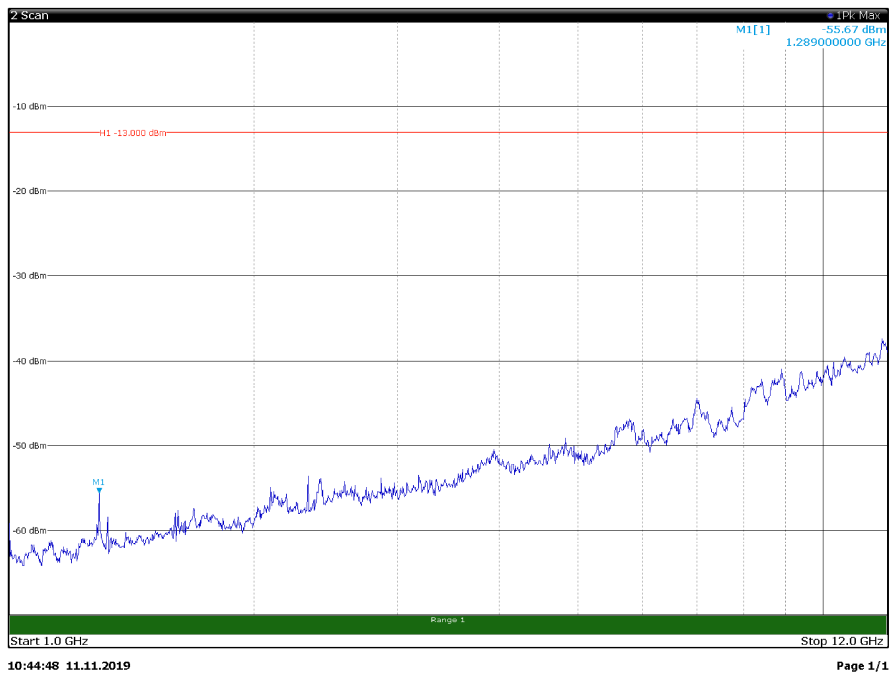
Vertical polarization

Spurious radiated emissions 1 GHz to 12 GHz

Spurious radiated emissions with input at AGC threshold at 619.5 MHz

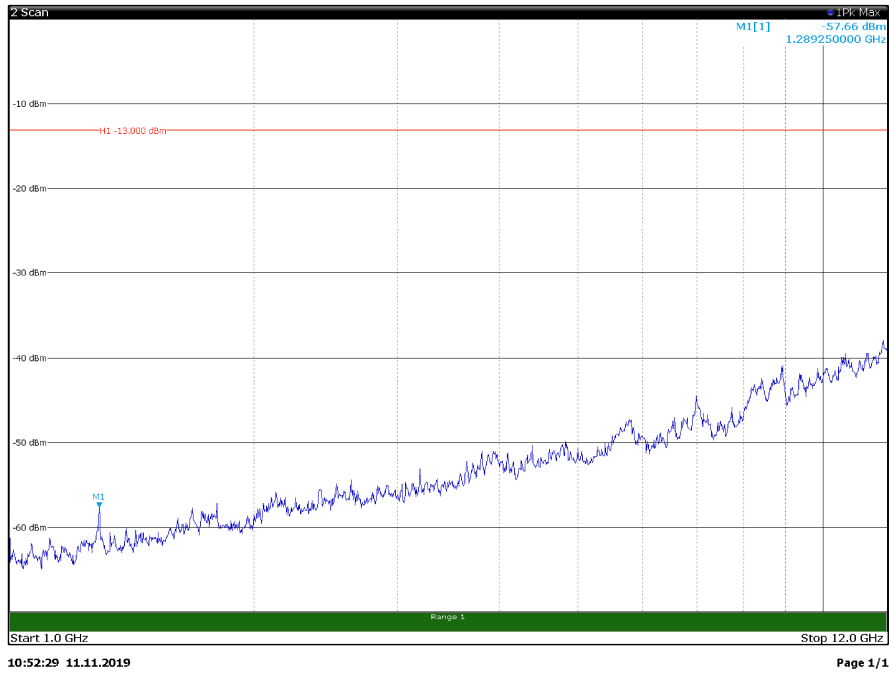


Horizontal polarization

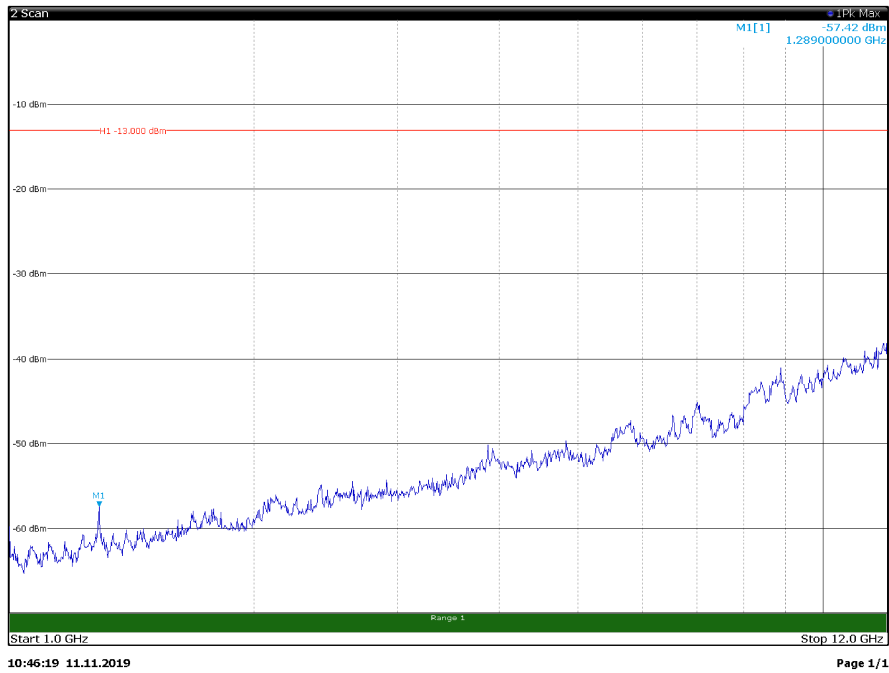


Vertical polarization

Spurious radiated emissions with input at AGC threshold at 634.5 MHz

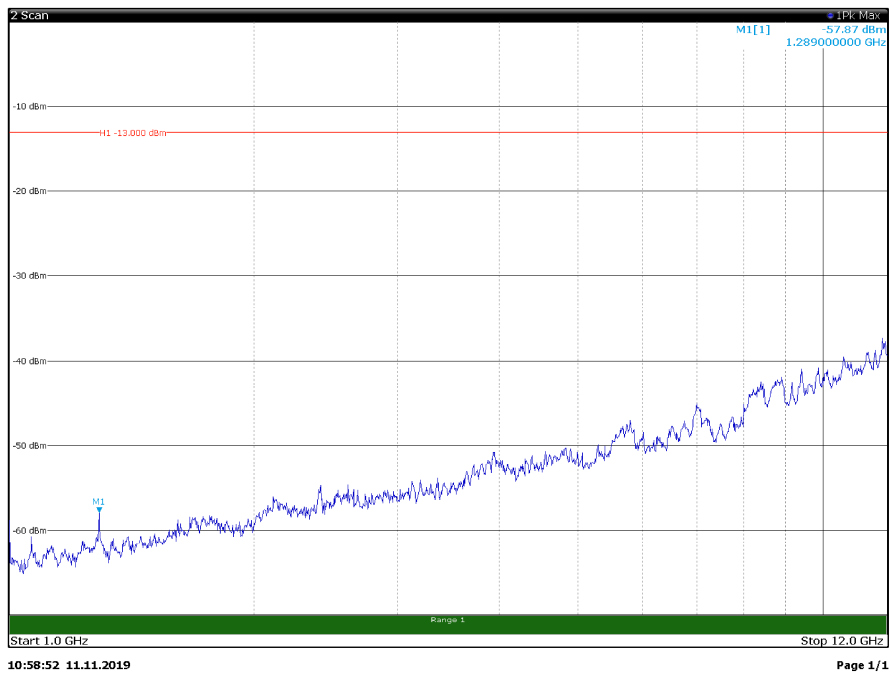


Horizontal polarization



Vertical polarization

Spurious radiated emissions with input at AGC threshold at 634.5 MHz



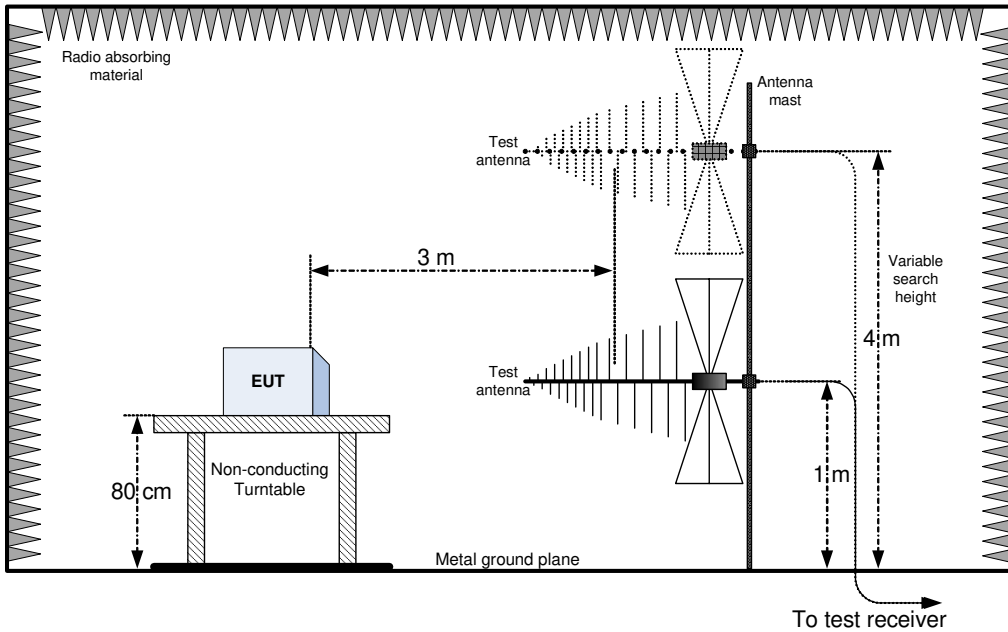
Horizontal polarization



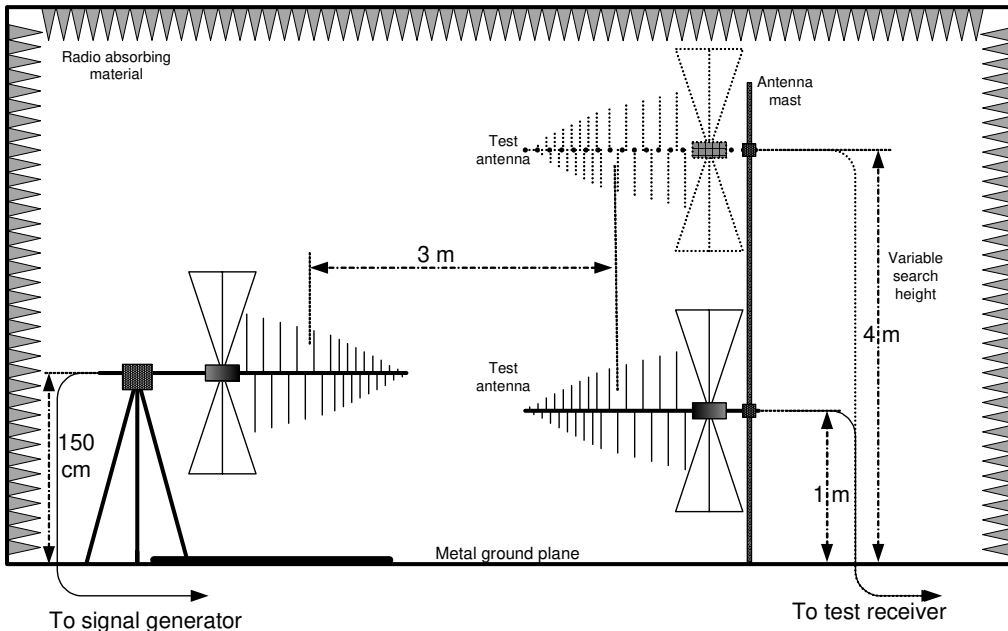
Vertical polarization

Appendix A: Block diagrams of test set-ups

Radiated emissions set-up

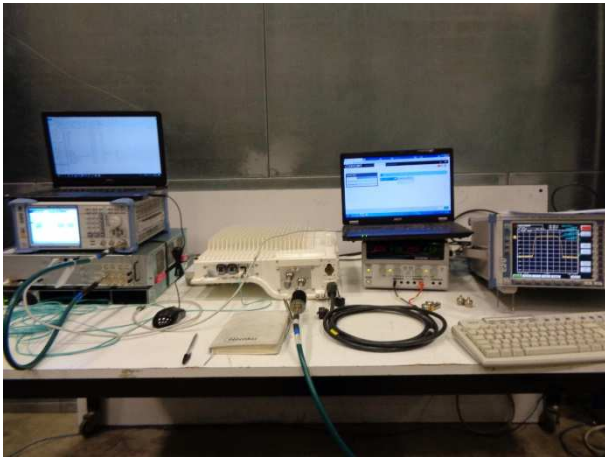
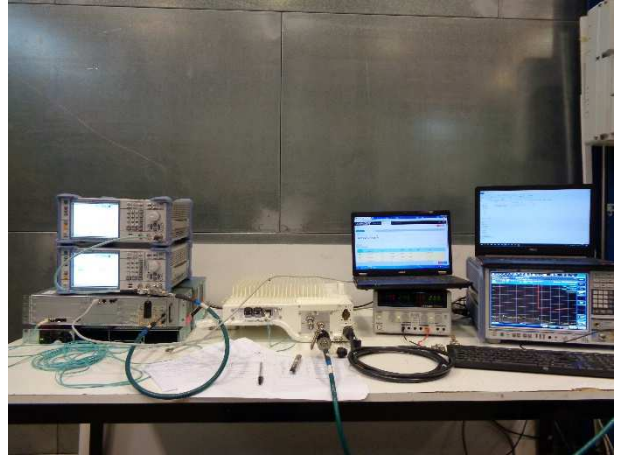


Substitution method set-up



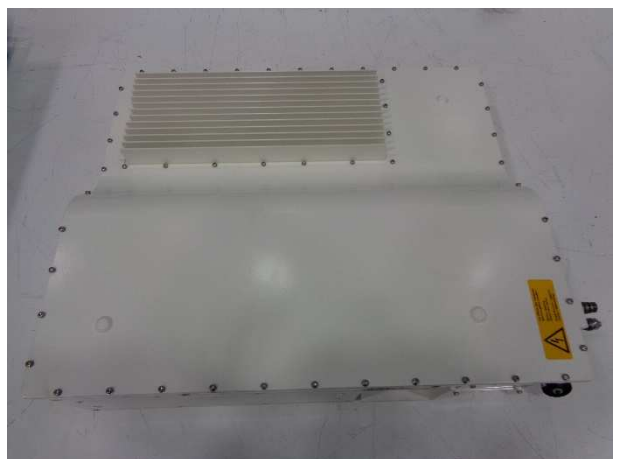
Appendix B: Photos

Set-up photos





EUT photos





End of report