



<b>Report Reference ID:</b>	372462-3TRFWL
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<b>Test specification:</b>	<p>Title 47 – Telecommunication Chapter I – Federal Communications Commission Part 90 – Private land mobile radio services</p> <p>RSS-131 Issue 3 Zone Enhancers</p> <p>RSS-140 Issue 1</p> <p>Equipment Operating in the Public Safety Broadband Frequency Bands 758-768 MHz and 788-798 MHz</p>
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<b>Applicant:</b>	<b>Andrew Wireless Systems</b> Industriering, 10 – 86675 Buchdorf – Germany
<b>Apparatus:</b>	Carrier Access Point
<b>Model:</b>	CAP M 4/70/80 F-AC; CAP M 4/70/80 F-DC
<b>FCC ID:</b>	XS5-CAPM47080
<b>IC Registration Number:</b>	2237E-CAPM47080

<b>Testing laboratory:</b>	<b>Nemko Spa</b> Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
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	<b>Name, function and signature</b>	<b>Date</b>
<b>Tested by:</b>	Tessa S.  (project handler)	2019-09-06
<b>Reviewed by:</b>	Barbieri P.  (verifier)	2019-09-06

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## Section 1: Report summary

### 1.1 Test specification

<b>Specifications</b>	FCC 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

### 1.2 Statement of compliance

<b>Compliance</b>	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 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.

### 1.3 Exclusions

<b>Exclusions</b>	None
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### 1.4 Registration number

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

### 2.1 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	Input/output power and amplifier/booster gain	Pass
--	935210 D05v01r03 Clause 4.6	Noise Figure	Pass
RSS-131 § 5.2 RSS-140 § 4.4 (b)	935210 D05v01r03 Clause 4.7.2	Out-of-band/out-of-block emissions conducted measurements	Pass
RSS-131 § 5.2 RSS-140 § 4.4 (b) RSS-140 § 4.4 (a)(i)	935210 D05v01r03 Clause 4.7.3	EUT spurious emissions conducted measurements	Pass
RSS-119 § 5.2.4 RSS-140 § 4.2	935210 D05v01r03 Clause 4.8	Frequency stability measurements	Pass
RSS-131 § 5.2 RSS-140 § 4.4 (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

<b>Applicant</b>	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:	--
<b>Manufacturer</b>	Name:	Andrew Wireless Systems
	Address:	Industriering, 10
	City:	Buchdorf
	Province/State:	--
	Post code:	86675
	Country:	Germany
<b>Canadian representative</b>	Name:	Andrew Wireless Systems
	Address:	Industriering, 10
	City:	Buchdorf
	Province/State:	--
	Post code:	86675
	Country:	Germany

### 3.2 Modular equipment

<b>a) Single modular approval</b>	Single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>b) Limited single modular approval</b>	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

### 3.3 Product details

<b>FCC ID</b>	Grantee code:	XS5
	Product code:	-CAPM47080
<b>IC ID</b>	Proposed certification number:	2237E-CAPM47080
<b>Equipment class</b>	B9B	
<b>Description of product as it is marketed</b>	Carrier Access Point	
	Model name:	CAP M 4/70/80 F-AC; CAP M 4/70/80 F-DC
	Serial number:	TEST 5
<b>Product</b>	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	
<b>Type of application</b>	<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	
<b>Services requested</b>	<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
Type of assessment	

3.6 Composite/related equipment	
<b>a) Composite equipment</b>	The EUT is a composite device subject to an additional equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>b) Related equipment</b>	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"/>
<b>c) Related FCC ID</b>	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 statues under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

3.7 Sample information	
<b>Receipt date:</b>	2019-06-06
<b>Nemko sample ID:</b>	372462-1/2

3.8 EUT technical specifications	
<b>Operating band:</b>	758 – 768 MHz
<b>Operating frequency:</b>	Wideband
<b>Modulation type:</b>	G7D
<b>Occupied bandwidth:</b>	12.5 kHz
<b>Channel spacing:</b>	Standard
<b>Emission designator:</b>	G7D
<b>RF Output</b>	Down Link: 31 dBm (1.26 W) Up Link: The EUT does not transmit over the air in the up-link direction
<b>Gain</b>	Down Link: 31 dB Up Link: The EUT does not transmit over the air in the up-link direction
<b>Antenna type:</b>	equipment with a 50 Ω RF connector (antenna not provided)
<b>Power source:</b>	100-240 Vac

### 3.9 Accessories and support equipment

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

#### Item # 1

Type of equipment:	Rack
Brand name:	CommScope
Model name or number:	7642110-01
Serial number:	21319110463
Connection port:	--
Cable length and type:	--

#### Item # 2

Type of equipment:	SUI Card
Brand name:	CommScope
Model name or number:	7642125-00
Serial number:	SZBEAC1839A0009
Connection port:	LAN port
Cable length and type:	2 m standard cable

#### Item # 3

Type of equipment:	OPT Card
Brand name:	CommScope
Model name or number:	7642123-00
Serial number:	SZBEAD1737A0070
Connection port:	Optical port
Cable length and type:	10 m optical fiber

#### Item # 4

Type of equipment:	2 x RFD Card
Brand name:	CommScope
Model name or number:	7633229-02
Serial number:	SZBEAP1919A0036 and SZBEAP1919A0023
Connection port:	RF port with QMA connector
Cable length and type:	1 m Coaxial cable

#### Item # 5

Type of equipment:	Power supply unit
Brand name:	CommScope
Model name or number:	7693531-00 with 7663610-00
Serial number:	PSU_1_0 + PSU12V_1_0
Connection port:	AC mains
Cable length and type:	1.5 m standard cable



### 3.10 Operation of the EUT during testing

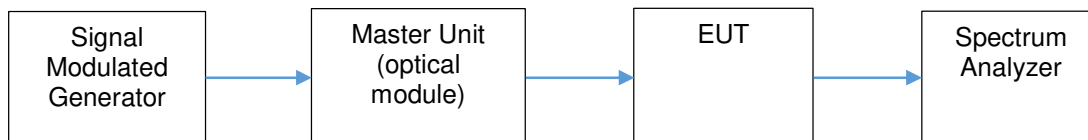
**Details:**

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

### 3.11 EUT setup diagram

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

**Test setup:**



**Procedure**

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

### 3.12 Software version

**Details:**

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

## Section 4: Engineering considerations

### 4.1 Modifications incorporated in the EUT

**Modifications**

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

### 4.2 Deviations from laboratory tests procedures

**Deviations**

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

### 4.3 Technical judgment

**Judgment**

None

## Section 5: Test conditions

### 5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

### 5.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	<p>Unless different values are declared in the test case, following ambient conditions apply for the tests:</p> <p>Temperature: <math>18 \div 33</math> °C  Relative humidity: <math>30 \div 60</math> %  Air pressure: <math>980 \div 1060</math> 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	MSR	MSR145B	330080

## 5.4 Measurement uncertainty

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

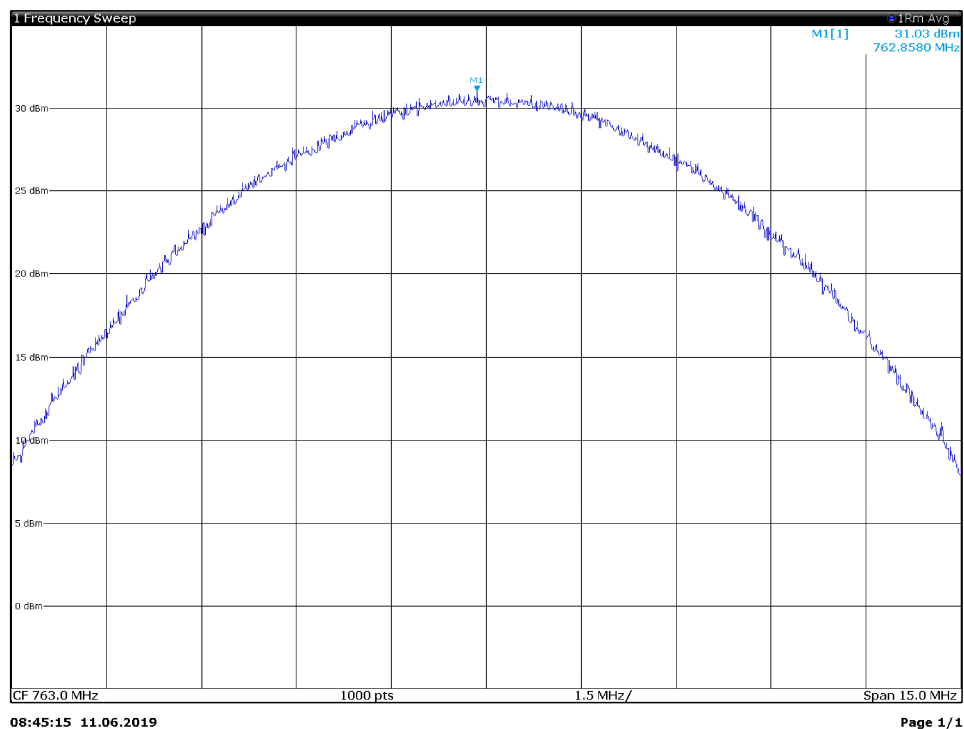
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$  which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %

## 5.5 Test equipment

Equipment	Manufacturer	Model	Serial N°	Cal Date	Due Date
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2018-07	2021-07
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2018-08	2019-08
EMI receiver (9 kHz ÷ 3 GHz)	Rohde & Schwarz	ESCI	100888	2018-09	2019-09
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	2019-01	2020-01
EMI receiver (2 Hz ÷ 44 GHz)	Rohde & Schwarz	ESW44	101620	2018-08	2019-08
Signal generator	Rohde & Schwarz	SMBV100A	263397	2018-09	2019-09
Signal generator	Rohde & Schwarz	SMBV100A	263254	2019-03	2020-03
Semi-anechoic chamber	Nemko	10 m semi-anechoic chamber	530	2018-09	2021-09
Shielded room	Siemens	10 m control room	1947	NSC	--
Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use					



## Test data



Output spectral plot with input at AGC threshold + 1 dB with AWGN signal at 763 MHz

## 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.

### **RSS-131 clause 5.2.1**

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

The gain-versus-frequency response and the 20 dB bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

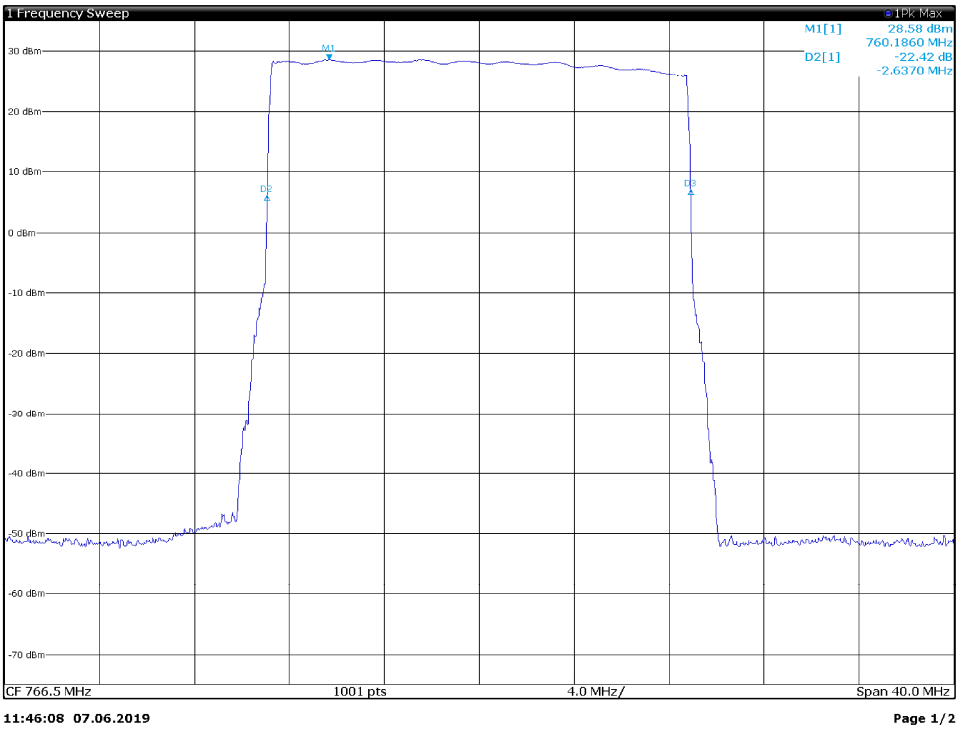
Test date: 2019-06-7

Test results: Pass

### Special notes

Modulation used: CW

Test data



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



### 6.3 Input-versus-output signal comparison

#### **FCC 90. FCC 90.219(e)(4)**

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

- (i) The signals are retransmitted on the same channels as received. Minor departures from the exact provider or reference frequencies of the input signals are allowed, *provided that* the retransmitted signals meet the requirements of § 90.213.
- (ii) There is no change in the occupied bandwidth of the retransmitted signals.
- (iii) The retransmitted signals continue to meet the unwanted emissions limits of § 90.210 applicable to the corresponding received signals (assuming that these received signals meet the applicable unwanted emissions limits by a reasonable margin).

#### **RSS-131 clause 5.2.2**

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

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

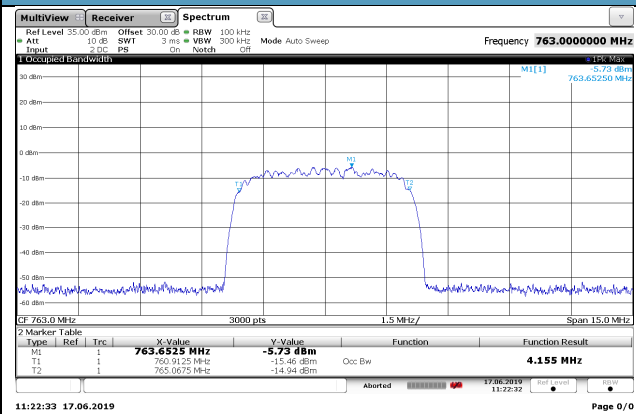
Test date: 2019-06-17

Test results: Pass

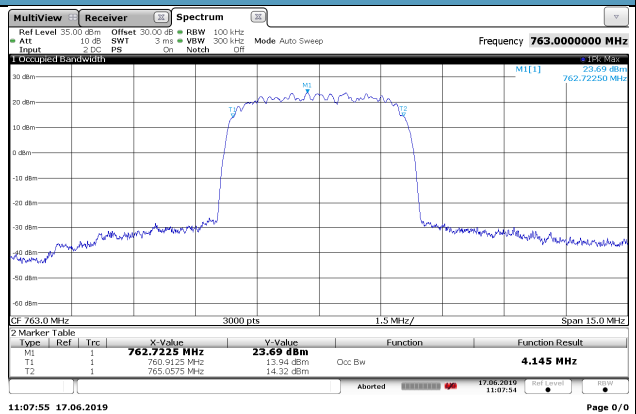
#### Special notes

Modulation used: AWGN

Test data



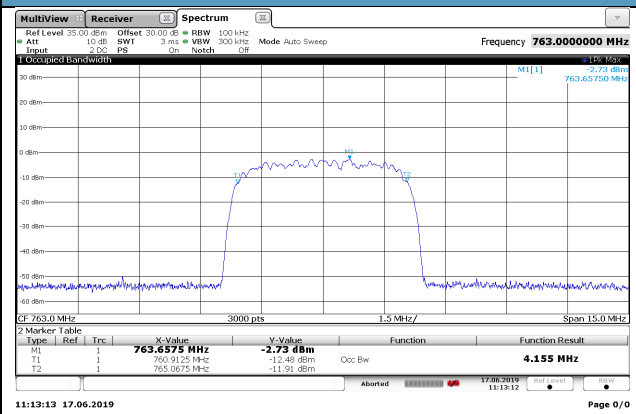
Input



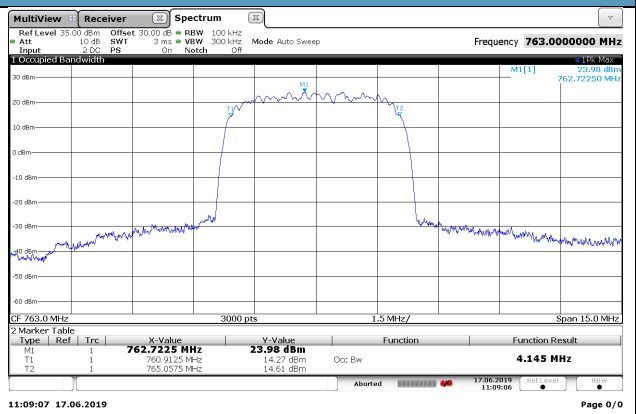
Output

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

Test data



Input



Output

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

## 6.4 Input/output power and amplifier/booster gain

### FCC 90.635(a)

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

**Table 2 — Transmitter Output Power**

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

### 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: 2019-06-26

Test results: Pass

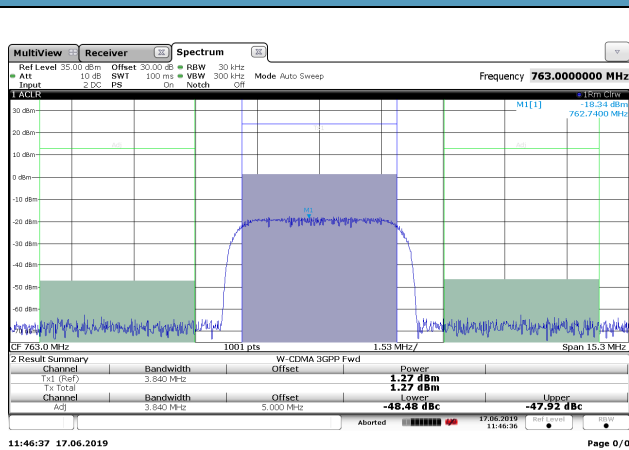
Special notes

Modulation used: AWGN

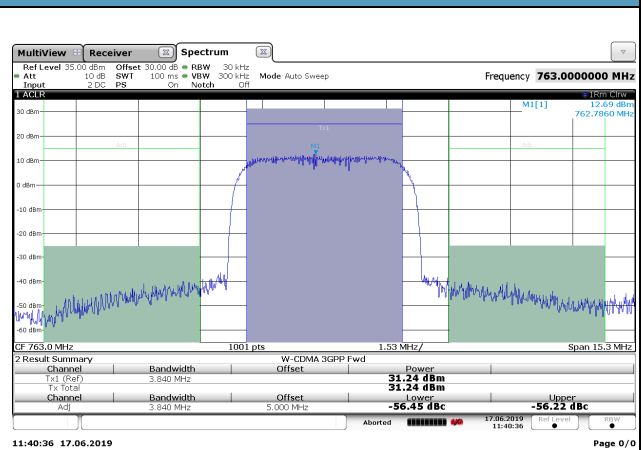
Test data

Gmax antenna gain (dBi) = 39.14 - 31.24 = 7.90 dBi

Test data



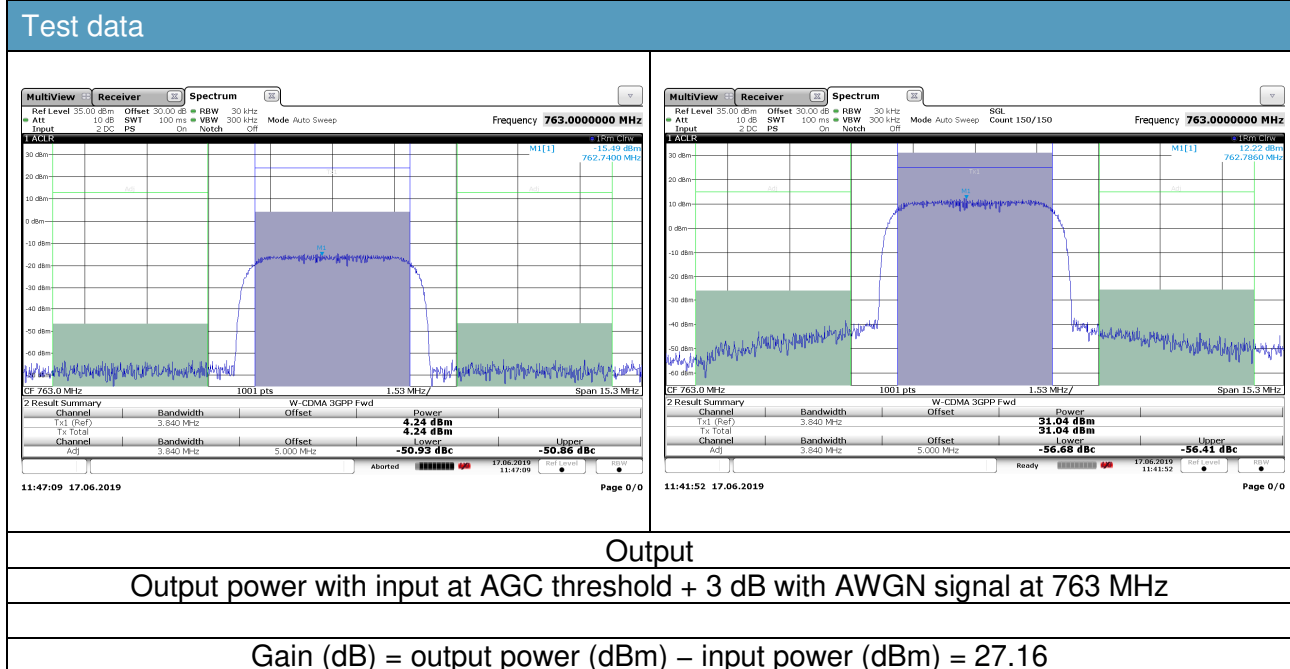
Input



Output

Output power with input at AGC threshold with AWGN signal at 763 MHz

Gain (dB) = output power (dBm) – input power (dBm) = 29.97



## 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  $\leq -43$  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  $\leq 9$  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: 2019-06-26

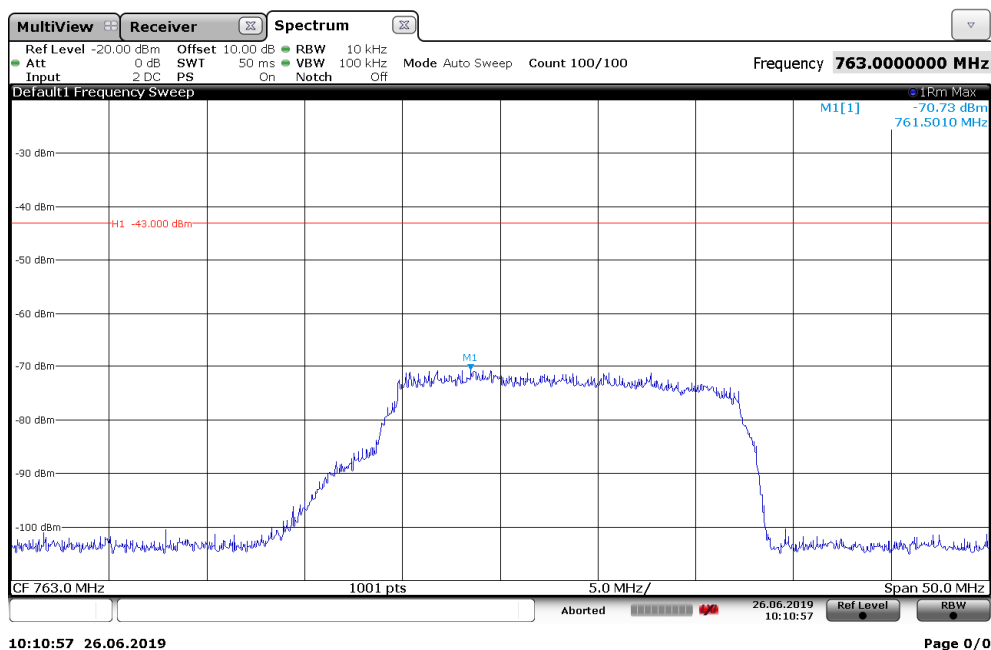
Test results: Pass

### Special notes

Spectrum analyzer settings:

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

### Test data



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

### **FCC 90.219 (e) (3)**

Device Specifications. In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

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

### **FCC 90.543 (e) (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 any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB.

### **RSS-131 clause 5.2**

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

### **RSS-140 clause 4.4 (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:

- 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: 2019-06-17

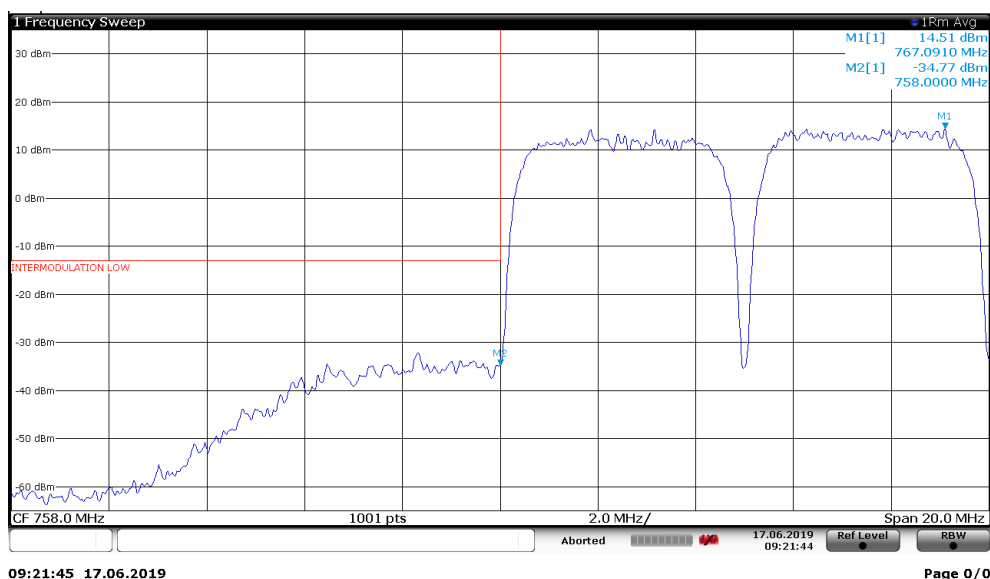
Test results: Pass

### Special notes

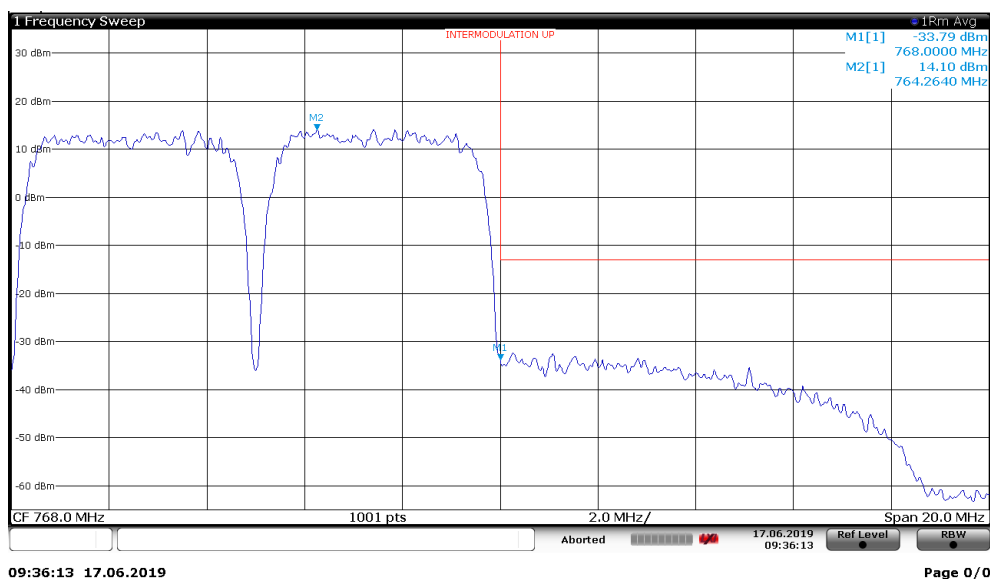
Modulation used: AWGN

Frequencies: 750.5 MHz, 765.5 MHz

### Test data

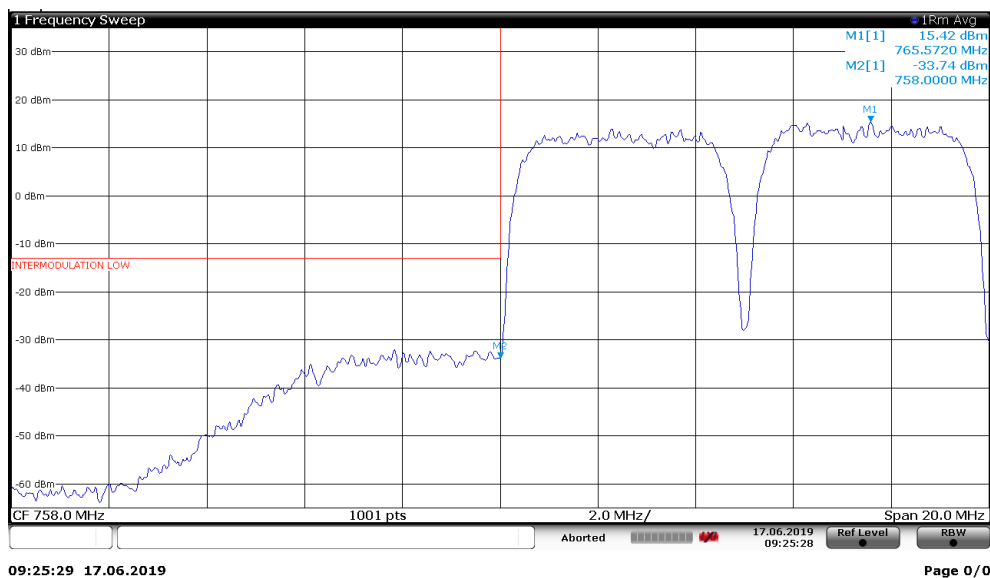


Lower block edge intermodulation with input at AGC threshold with AWGN signal

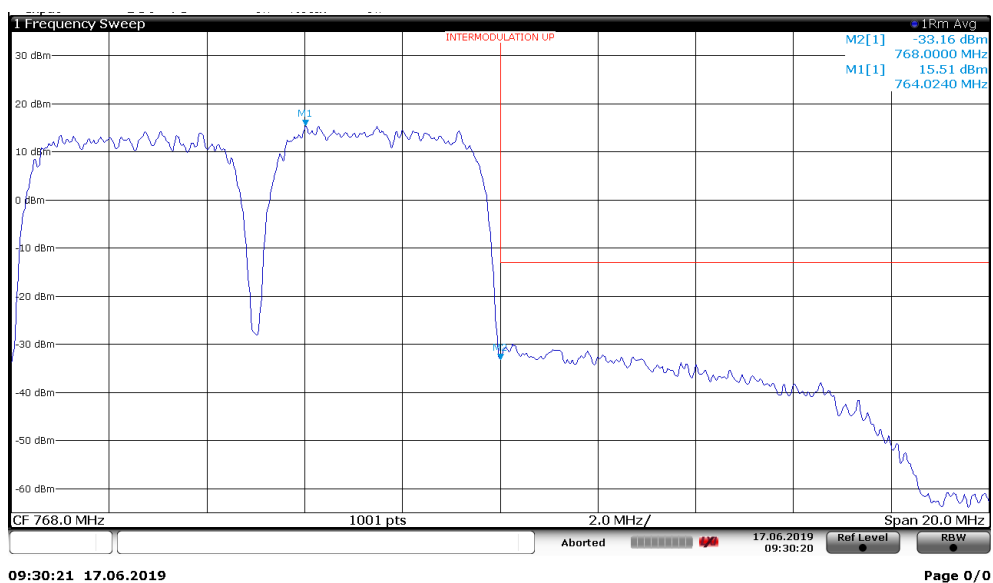


Upper block edge intermodulation with input at AGC threshold with AWGN signal





Lower block edge intermodulation with input at AGC + 3 dB threshold with AWGN signal



Upper block edge intermodulation with input at AGC threshold + 3 dB with AWGN signal

## 6.7 EUT spurious emissions conducted measurements

### **FCC 90.543 (e) (1)**

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.

### **FCC 90.543 (e) (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 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-131 clause 5.2**

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

### **RSS-140 clause 4.4 (a)(i)**

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:
  - (i)  $76 + 10 \log (p)$ , dB in a 6.25 kHz band for fixed and base station equipment

### **RSS-140 clause 4.4 (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:

- 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.

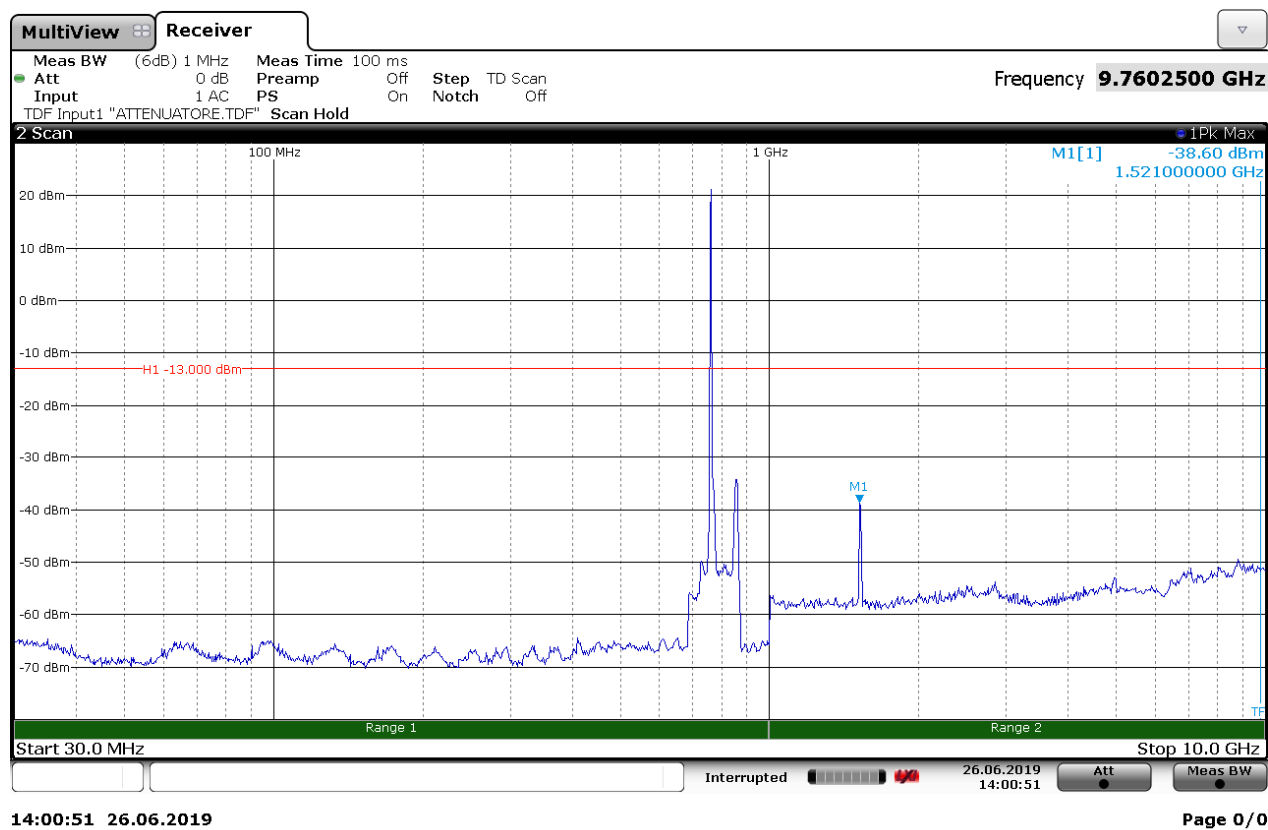
Test date: 2019-06-26 and 2019-09-06

Test results: Pass

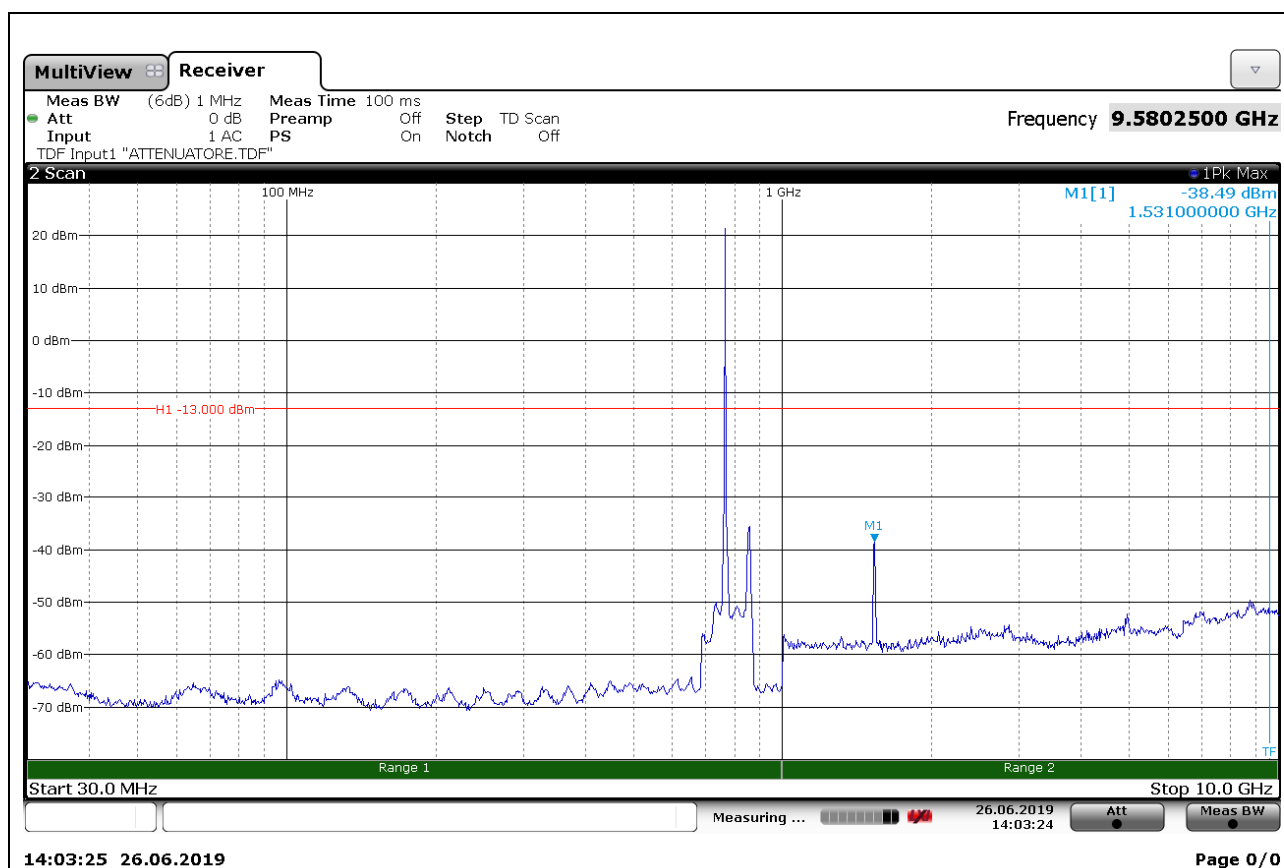
Special notes

Modulation used: CW

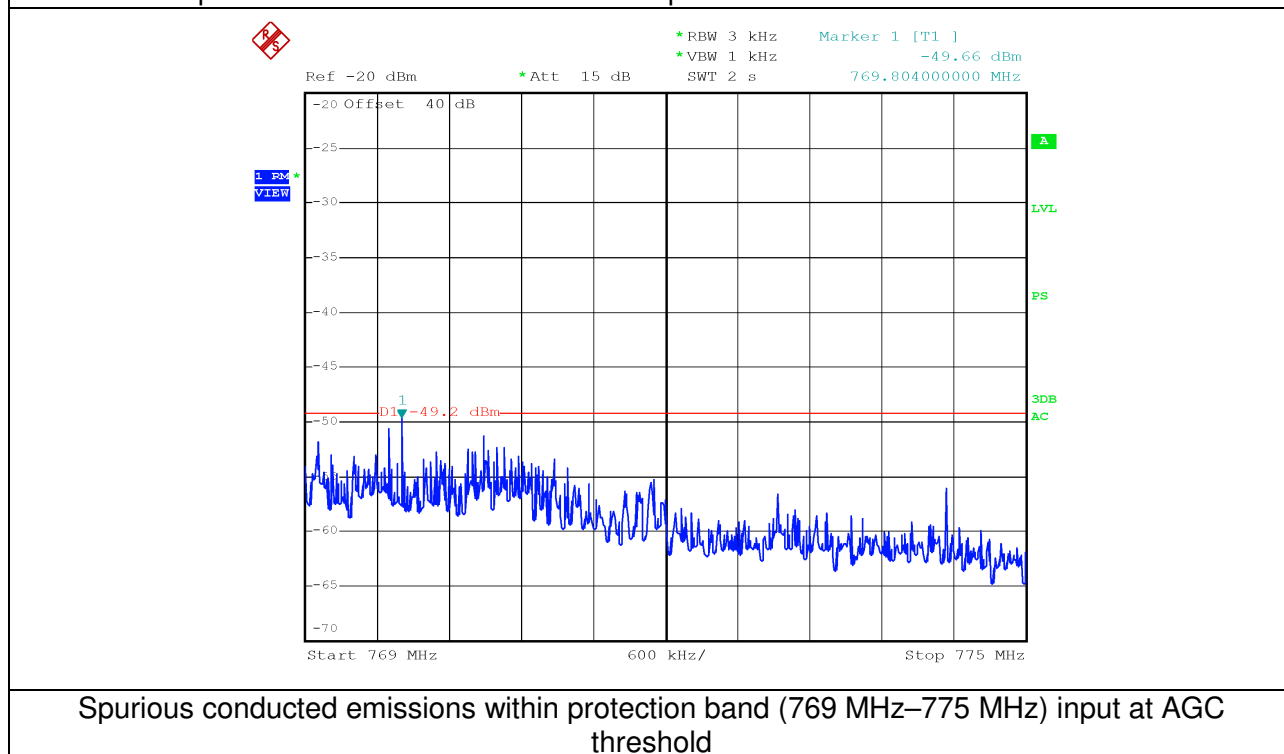
## Test data

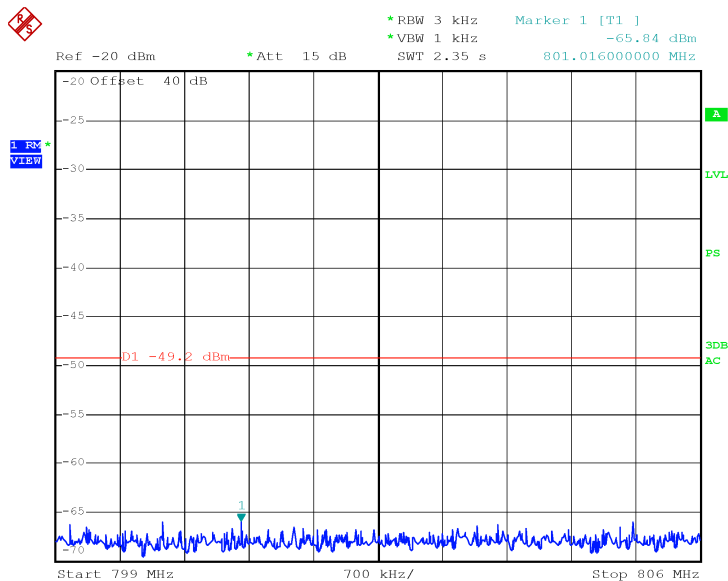


Spurious conducted emissions with input at AGC threshold at 760.5 MHz

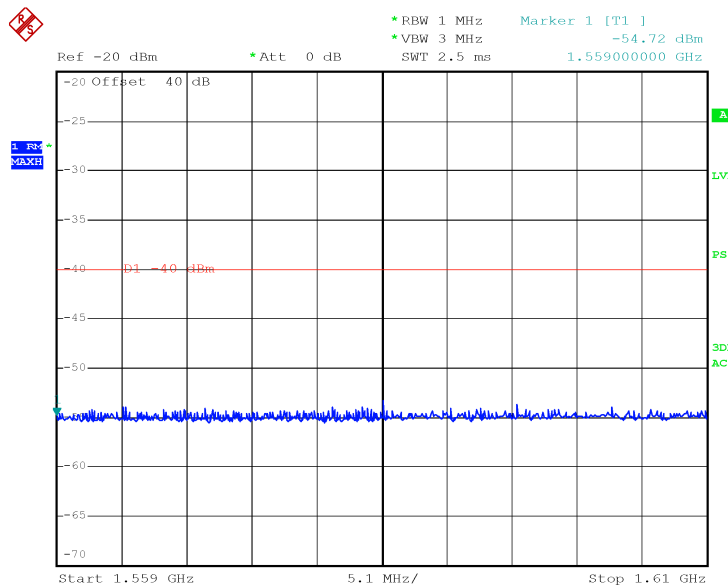


### Spurious conducted emissions with input at AGC threshold at 765.5 MHz





Spurious conducted emissions within protection band (799 MHz–806 MHz) input at AGC threshold



Spurious conducted emissions within protection band (1559 MHz–1610 MHz) input at AGC threshold

## 6.8 Frequency stability measurements

### **FCC 90.539(d)**

Transmitters designed to operate in 769-775 MHz and 799-805 MHz frequency bands must meet the frequency stability requirements in this section.

- 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  $\pm 1.5$  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: 2019-06-18 and 2019-06-19
Test results: Pass

Special notes
Modulation used: CW.

Test data			
Test conditions	Frequency, GHz	Drift, Hz	ppm
+50 °C, Nominal	762.999.433	17	0,02
+40 °C, Nominal	762.999.409	41	0,05
+30 °C, Nominal	762.999.374	76	0,10
+20 °C, +15 %	762.999.440	10	0,01
+20 °C, Nominal	762.999.450	<i>Reference</i>	<i>Reference</i>
+20 °C, -15 %	762.999.457	-7	-0,01
+10 °C, Nominal	762.999.444	6	0,01
0 °C, Nominal	762.999.433	17	0,02
-10 °C, Nominal	762.999.400	50	0,07
-20 °C, Nominal	762.999.410	40	0,05
-30 °C, Nominal	762.999.390	60	0,08

## 6.9 Spurious emissions radiated measurements

### **FCC 90.543(e)(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 any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB.

### **RSS-131 clause 5.2**

Industrial Zone Enhancers, including DASs, shall employ a gain control feature and shall comply with all the requirements in the RSS which applies to the equipment with which the zone enhancer is to be used. In addition, the equipment shall comply with the requirements specified in this section.

### **RSS-140 clause 4.4 (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 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: 2019-06-10 and 2019-06-11

Test results: Pass

### Special notes

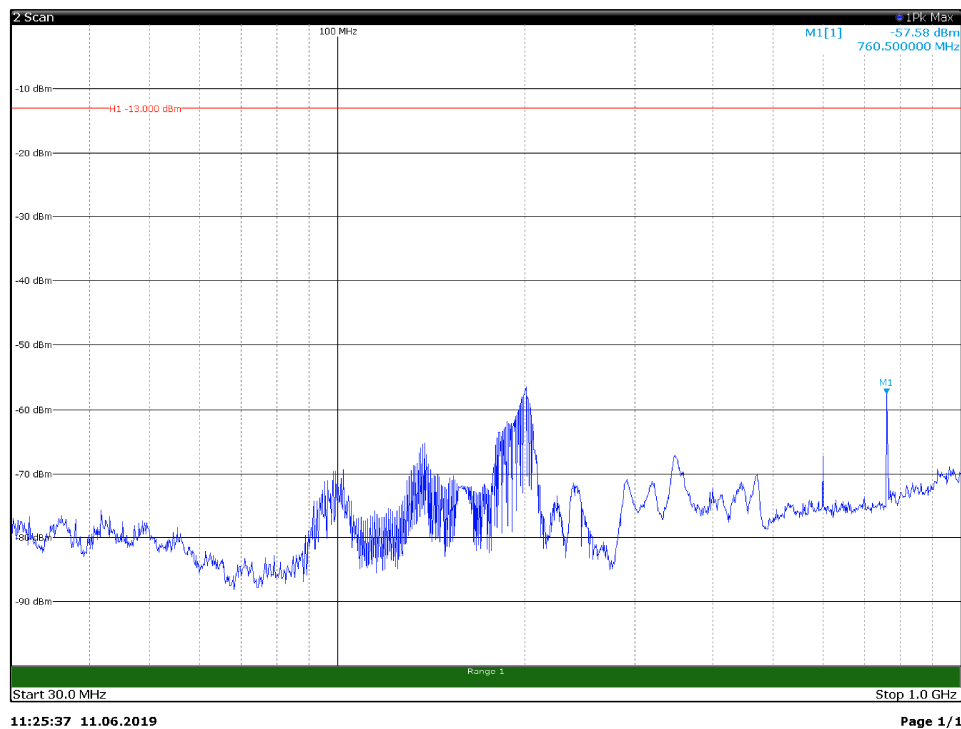
Modulation used: AWGN



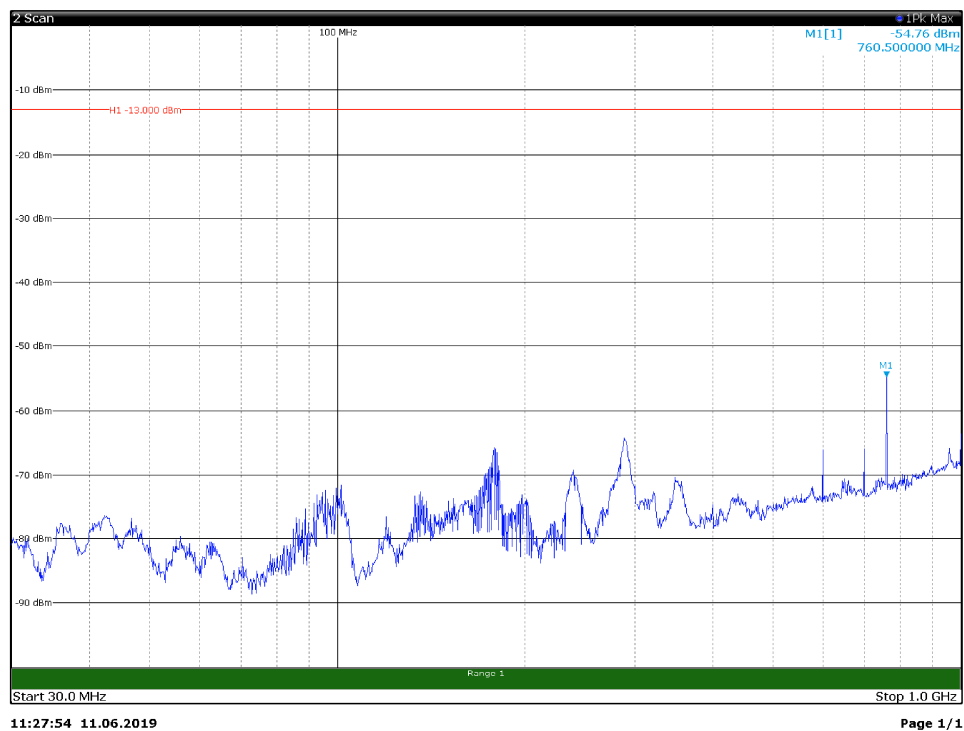
## Test data

### Spurious radiated emissions 30 MHz to 1 GHz

#### Spurious radiated emissions with input at AGC threshold with AWGN signal at 760.5 MHz

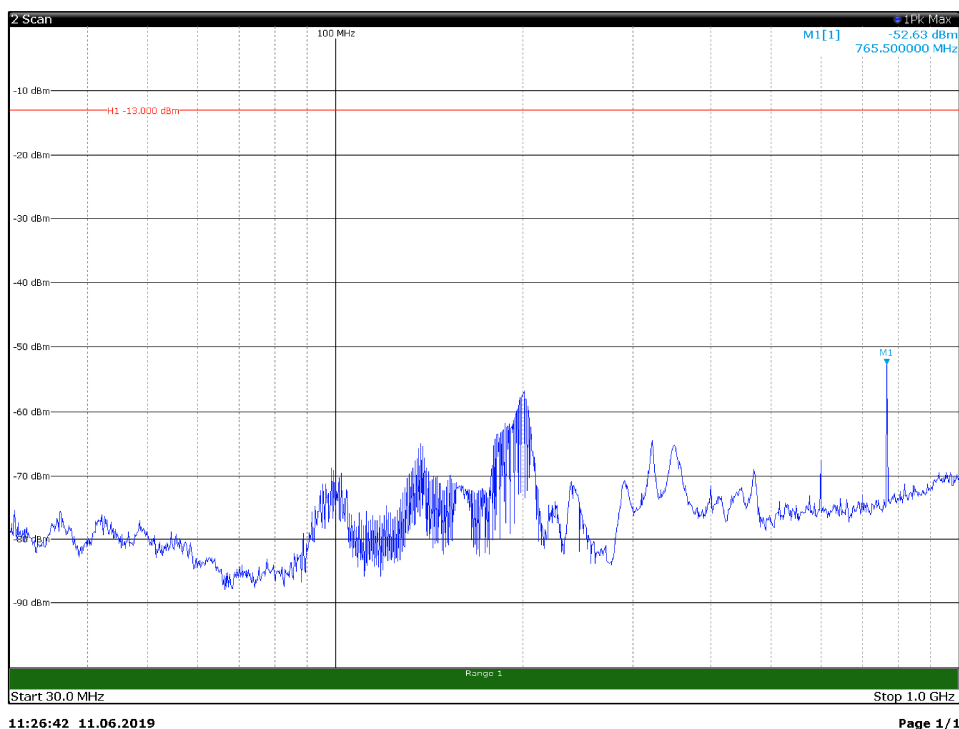


### Horizontal polarization

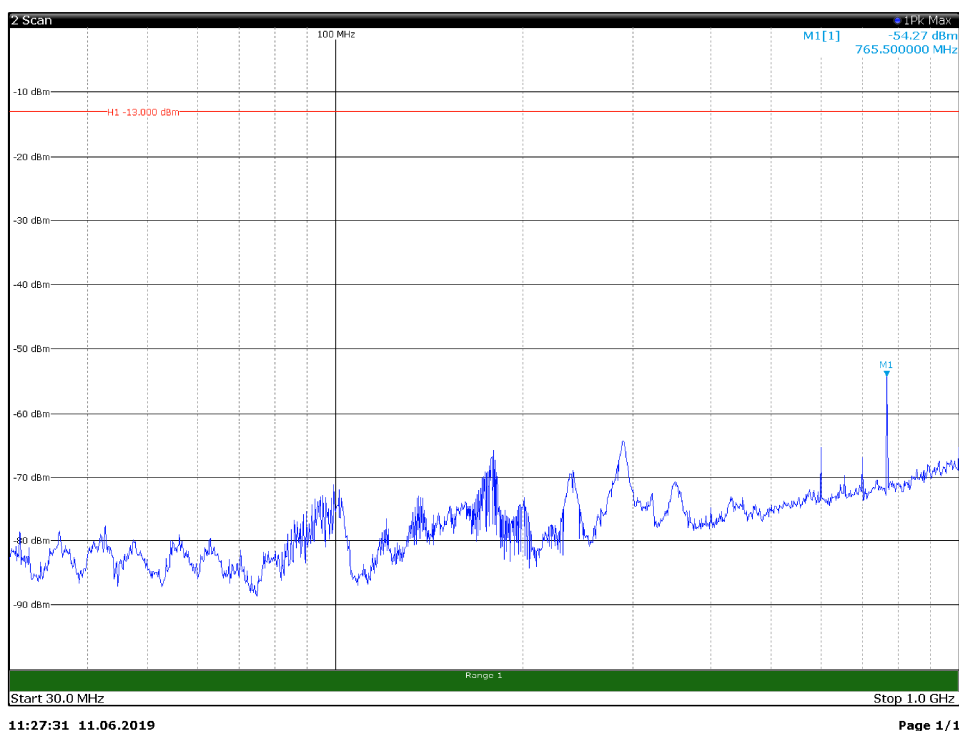


### Vertical polarization

## Spurious radiated emissions with input at AGC threshold with AWGN signal at 765.5 MHz



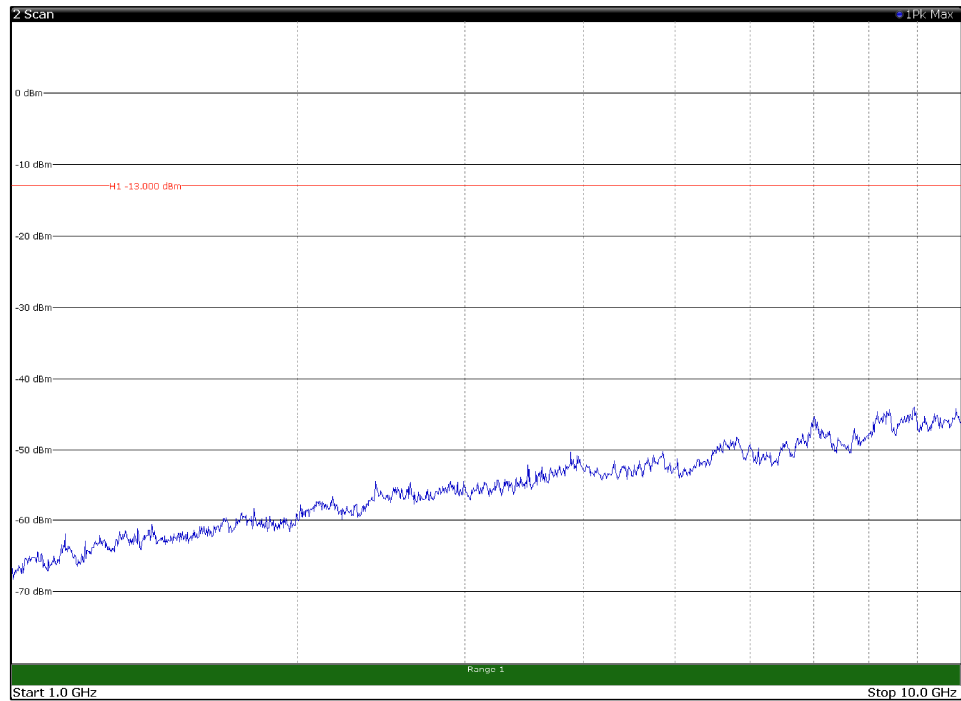
### Horizontal polarization



### Vertical polarization

## Spurious radiated emissions 1 GHz to 10 GHz

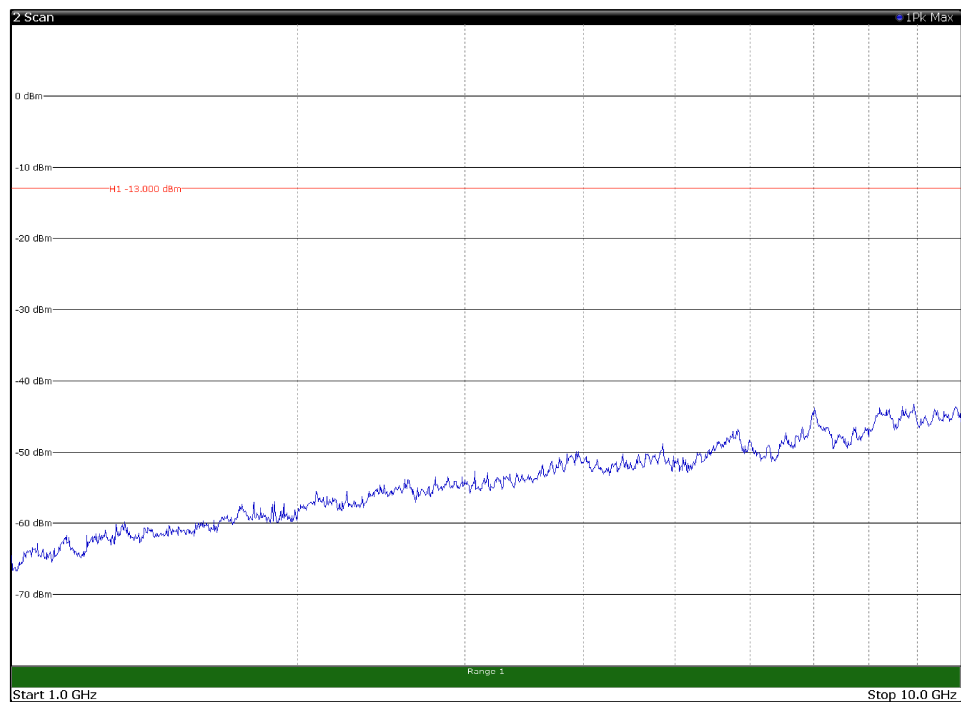
Spurious radiated emissions with input at AGC threshold with AWGN signal at 760.5 MHz



08:57:25 10.06.2019

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## Horizontal polarization

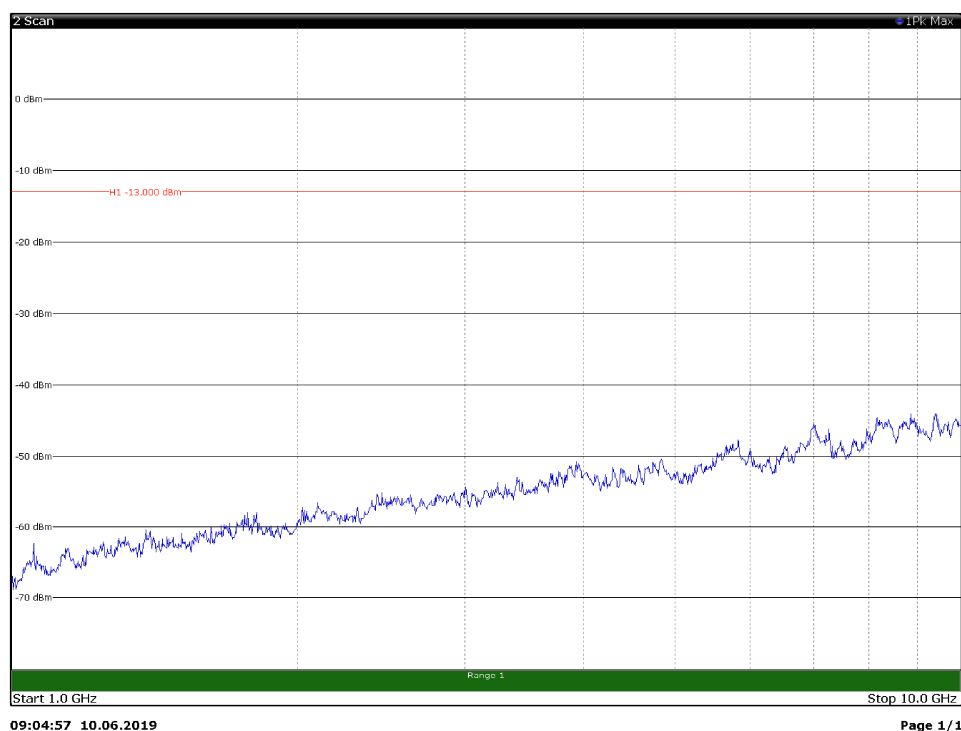


09:00:18 10.06.2019

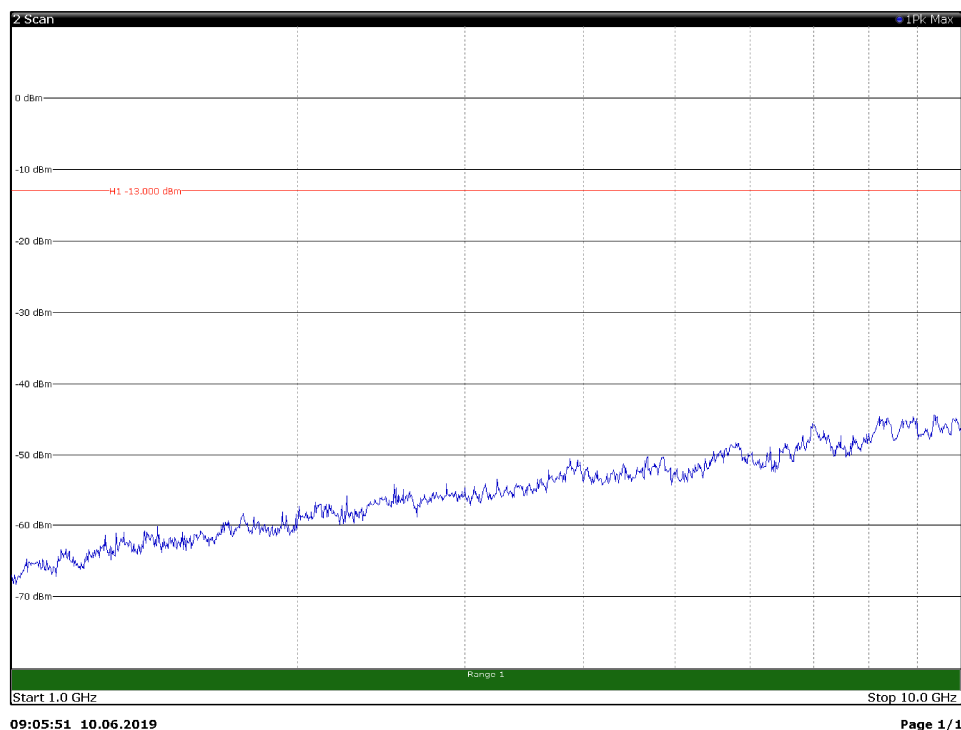
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## Vertical polarization

## Spurious radiated emissions with input at AGC threshold with AWGN signal at 765.5 MHz



### Horizontal polarization



### Vertical polarization

The diagram illustrates a reverberation chamber setup for testing an Electromagnetic Interference Susceptibility (EIS) system. The chamber is bounded by radio absorbing material. Inside, a Non-conducting Turntable is positioned at a height of 80 cm from the Metal ground plane. An EUT (Equipment Under Test) is placed on the turntable. Two Test antennas are positioned at a distance of 3 m from the turntable. The antennas are connected to an Antenna mast, which is adjustable to a height of 4 m. The mast is also connected to a Variable search height mechanism. The setup is designed to measure the EIS of the EUT in a reverberant environment.

Radio absorbing material

150 cm

3 m

Test antenna

Test antenna

Antenna mast

4 m

1 m

Variable search height

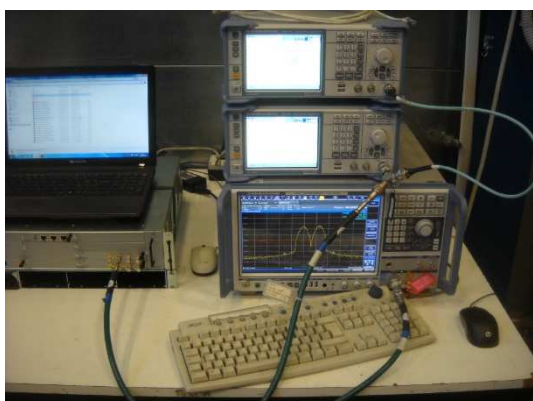
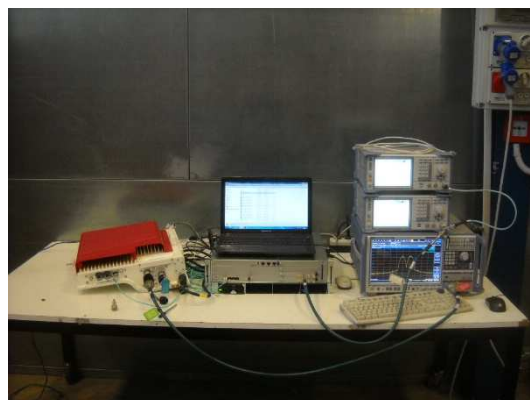
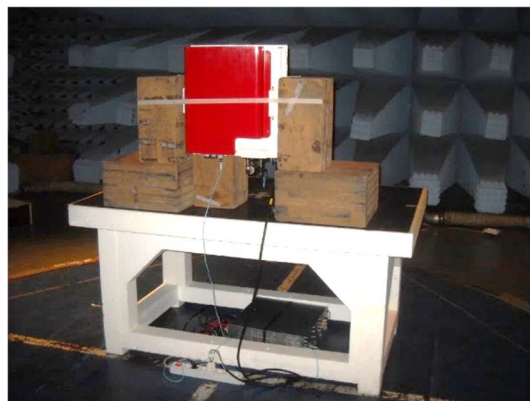
Metal ground plane

To signal generator

To test receiver

## Appendix B: Photos

### Set-up photos



EUT photos



End of report