
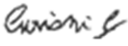


Report Reference ID:	309138-1TRFWL
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Test specification:	<b>Title 47 – Telecommunication</b> Chapter I – Federal Communications Commission Subchapter D – Safety and special radio services Part 90 – Private land mobile services Subpart I – General technical standards
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Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)
Apparatus:	Enhanced Power Remote Unit
Model:	TRL8SC1925AT
FCC ID:	XM2-EP8SC1925

Testing laboratory:	<b>Nemko Italy Spa</b> Via del Carroccio, 4 20853 Biassono (MB) – Italy Telephone: +39 039 2201201 Facsimile: +39 039 2201221
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	Name and title	Date
Tested by:	 <u>P. Barbieri</u> , Wireless/EMC Specialist	2016-06-24
Reviewed by:	 <u>G. Curioni</u> , Wireless/EMC Specialist	2016-06-24

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## Section 1: Report summary

### 1.1 Test specification

<b>Specifications</b>	<b>Part 90 – Private land mobile services</b>
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### 1.2 Statement of compliance

<b>Compliance</b>	<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 Canada Inc. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Radiated tests were conducted in accordance with ANSI C63.4-2003.</p>
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### 1.3 Exclusions

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

<b>Test site FCC ID number</b>	176392 (3 m Semi anechoic chamber)
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### 1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1TRF	----

### 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.

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## Section 2: Summary of test results

### 2.1 FCC Part 90, test results

Part	Methods	Test description	Verdict
	§ 935210 D05v01 (3.2)	AGC threshold	Pass
	§ 935210 D05v01 (3.3)	Out of band rejection	Pass
§90.209	§ 935210 D05v01 (3.4)	Occupied bandwidth	Pass
§90.205	§ 935210 D05v01 (3.5)	Peak output power at RF antenna connector	Pass
§90.210	§ 935210 D05v01 (3.6)	Spurious emissions at RF antenna connector	Pass
§90.210	§ 935210 D05v01 (3.8)	Radiated spurious emissions	Pass
§90.213	§ 935210 D05v01 (3.7)	Frequency stability	N/A a)

Notes:

- a) NOT APPLICABLE: Modulation/frequency conversion circuitry not in use. No frequency change in EUT (input and output have same frequency)

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

### 3.1 Applicant details

<b>Applicant complete business name</b>	Name:	Teko Telecom Srl
	Federal Registration Number (FRN):	0018963462
	Grantee code	XM2
<b>Mailing address</b>	Address:	Via Meucci, 24/a
	City:	Castel S. Pietro Terme
	Province/State:	Bologna
	Post code:	40024
	Country:	Italy

### 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:	XM2
	Product code:	-EP8SC1925
<b>Equipment class</b>	B2I	
<b>Description of product as it is marketed</b>	Booster	
	Model name/number:	TRL8SC1925AT
	Serial number:	1004837001

### 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
		Original FCC ID: Grant date:
	<input type="checkbox"/>	Class II permissive change or modification of presently authorized equipment

## Section 3: Equipment under test

### 3.5 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 statuses under the FCC ID(s) listed below: i FCC ID: ii FCC ID:

### 3.6 Sample information

<b>Receipt date:</b>	2016-06-20
<b>Nemko sample ID number:</b>	-----

### 3.7 EUT technical specifications

<b>Operating band:</b>	Down Link: 862–869 MHz, Up Link: 817-824 MHz
<b>Operating frequency:</b>	Wideband
<b>Modulation type:</b>	iDEN, GSM, EDGE, CDMA, WCDMA, LTE (QAM and QPSK)
<b>Occupied bandwidth:</b>	Standard
<b>Channel spacing:</b>	standard
<b>Emission designator:</b>	iDEN: D7W GSM and EDGE: GXW; CDMA, WCDMA: F9W, LTE: D7W
<b>RF Output</b>	Down Link: 31dBm (1,25W) Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)
<b>Gain</b>	Down Link: 36dB Up Link: N.A. (The EUT does not transmit over the air in the up-link direction)
<b>Antenna type:</b>	External Antenna is not provided, equipment that has an external 50 $\Omega$ RF connector
<b>Power source:</b>	100-240 Vac

## Section 3: Equipment under test

### 3.8 Accessories and support equipment

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

Item # 1	
Type of equipment:	Master Unit - Subrack
Brand name:	Teko Telecom srl
Model name or number:	SUB-TRX-PSU
Serial number:	101083001
Nemko sample number:	-----
Connection port:	-----
Cable length and type:	-----
Item # 2	
Type of equipment:	Master Unit – Management Module
Brand name:	Teko Telecom srl
Model name or number:	TSPV-R
Serial number:	110942253
Nemko sample number:	-----
Connection port:	LAN port
Cable length and type:	-----
Item # 3	
Type of equipment:	Master Unit – Optical Module
Brand name:	Teko Telecom srl
Model name or number:	TTRU4W-S-M
Serial number:	110679007
Nemko sample number:	-----
Connection port:	DL/UL RF connector (to connect to the base station) Optical port (to connect to remote unit)
Cable length and type:	-----
Item # 4	
Type of equipment:	Master Unit – Power Supply
Brand name:	Teko Telecom srl
Model name or number:	TPSU/AC
Serial number:	081063004
Nemko sample number:	-----
Connection port:	-----
Cable length and type:	-----



### 3.9 Operation of the EUT during testing

**Details:**

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

### 3.10 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 viceversa 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 (under another FCC ID) to exercise the EUT. Signal generator is linked directly to the RF connector of optical module in the Master Unit.

**Test setup for output power, occupied bandwidth, spurious emissions:**

**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.

## 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	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa  When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5$ %, for which the equipment was designed.

## Section 5: Test conditions, continued

### 5.3 Measurement uncertainty

Nemko S.p.A. measurement uncertainty has been calculated using the standard CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements". All calculations can be found in Nemko S.p.A. document WML1002.

### 5.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Vector Signal Generator	Agilent	N5172B EXG	MY53051238	Jan 2018
Vector Signal Generator	Agilent	E4438C ESG	MY45094485	Ago 2016
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	Jun 2016
Network Analyzer	Agilent	E5071C ENA	MY46106183	Jun 2016
V-network	R & S	ESH2-Z5	872 460/041	11/2016
Trilog Broad Band Antenna 25-2000 MHz	Schwarzbeck	VULB 9168	VULB 9168-242	06/2018
Trilog Broad Band Antenna 25-8000 MHz	Schwarzbeck	VULB 9162	VULB 9162-25	07/2018
Antenna 1-18 GHz	Schwarzbeck	STLP 9148	STPL 9148-123	06/2018
Double ridge waveguide horn	RFspin	DRH40	061106A40	08/2016
Preamplifier 18-40 GHz	Miteq	JS44	1648665	12/2016
Broadband preamplifier 1-18 GHz	Schwarzbeck	BBV 9718	9718-137	10/2016
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	04/2017
EMI receiver 20 Hz ÷ 3 GHz	R&S	ESCI	100888	09/2016
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR
Turning-table	R&S	HCT	835 803/03	NCR
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Spectrum Analyzer 9kHz ÷ 40GHz	R&S	FSEK	848255/005	11/2016
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2016
Shielded room	Siemens	10m control room	1947	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	70	NCR
Shielded Room	Siemens	3m semi-anechoic chamber	3	NCR
Motor controller	Emco	1051-25	9012-1559	NCR
Motor controller	Emco	1061-1.521	9012-1508	NCR
Antenna Tower	Emco	2071-2	9601-1940	NCR
Controller pole/table	Emco	2090	9511-1099	NCR

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use  
(\*) Equipment supplied by manufacturer's

## Appendix A: Test results

### Clause 935210 D05v01 (3.2) AGC threshold

Measure of EUT AGC Threshold

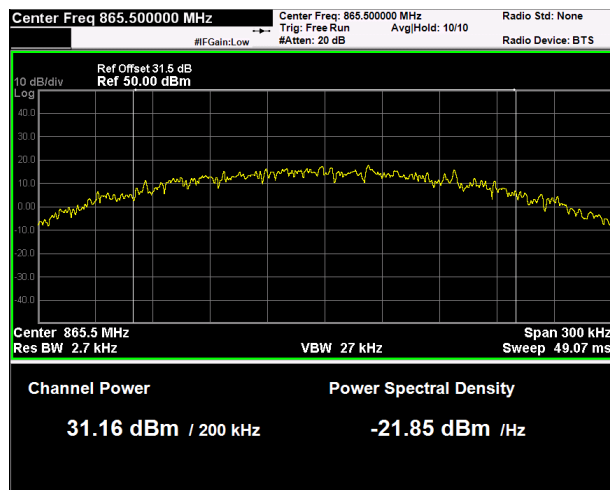
Test date: 2016-06-21

Test results: Pass

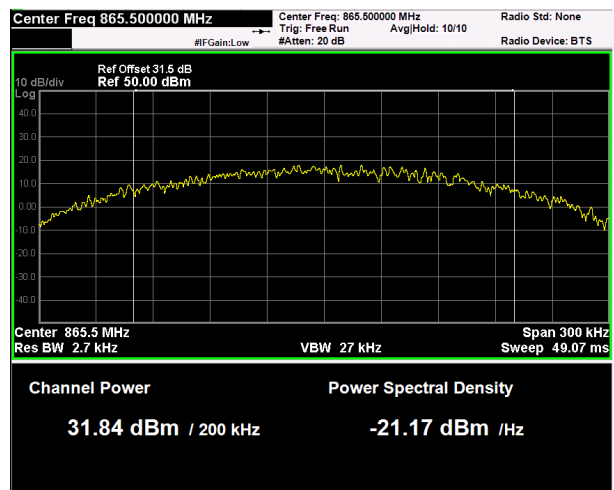
#### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

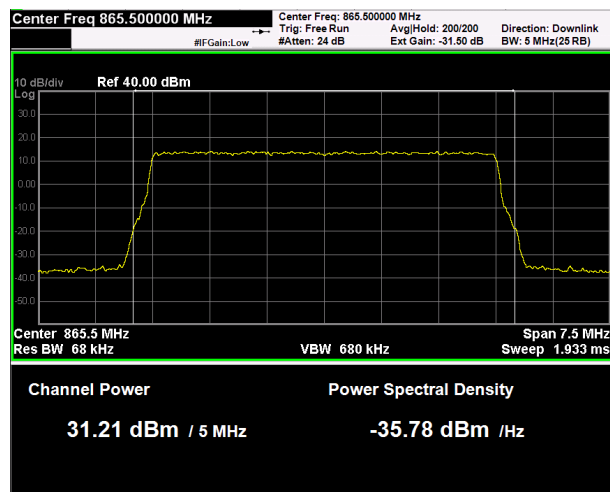
#### Test data



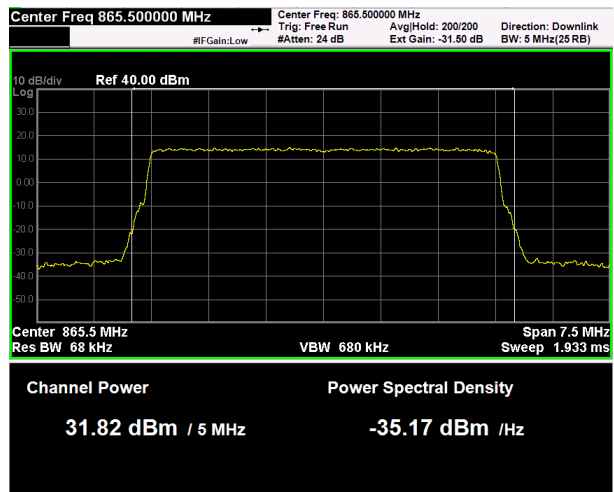
MSK signal, nominal input signal



MSK signal, nominal input signal +1 dB



AWGN signal, nominal input signal



AWGN signal, nominal input signal +1 dB

## Clause 935210 D05v01 (3.3) Out of band rejection

Out of Band Rejection – Test for rejection of out of band signals.

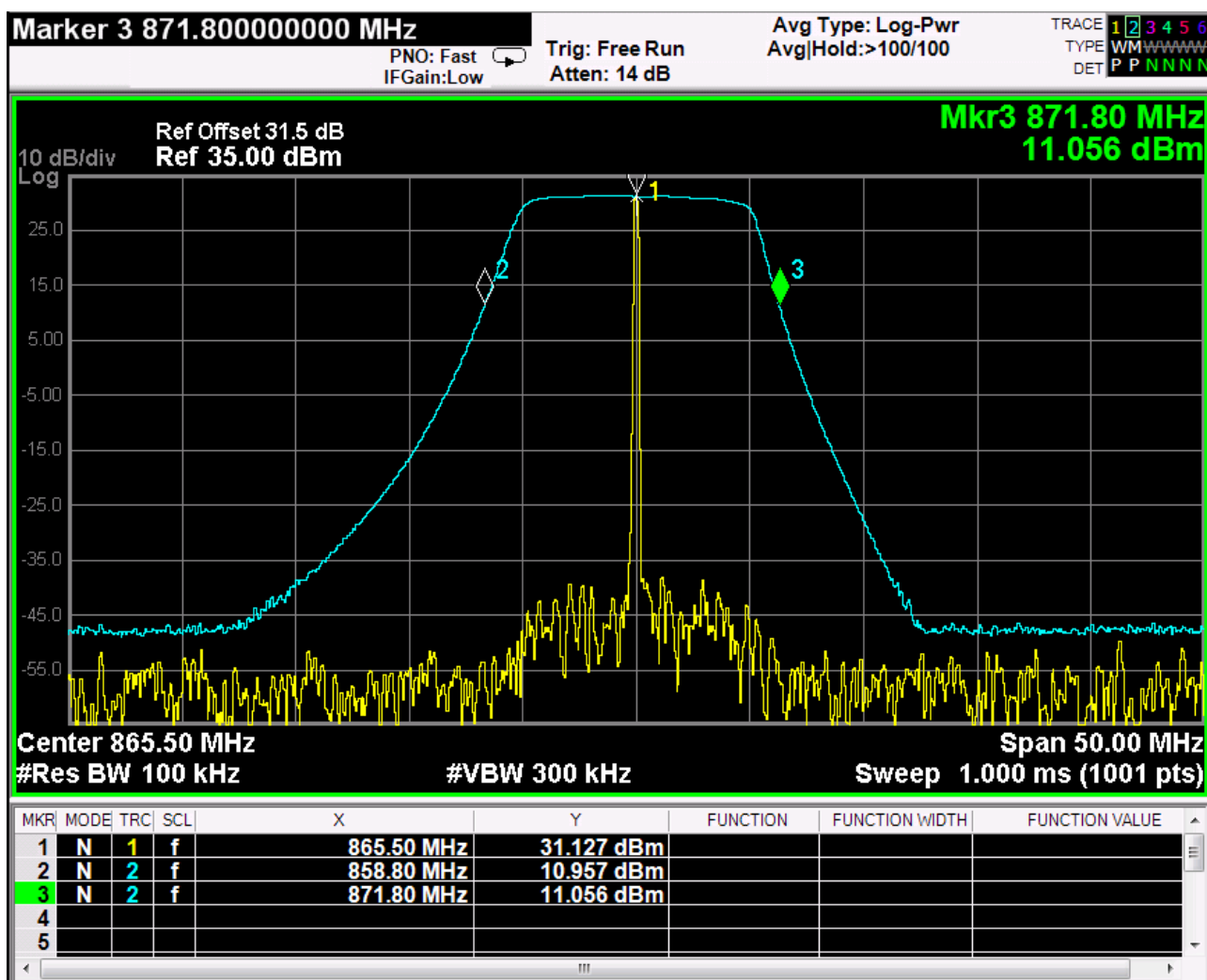
Test date: 2016-06-21

Test results: Pass

### Special notes

–

### Test data



## Clause 90.209 Occupied bandwidth

### §90.209(b)(7)

Economic Area (EA)-based licensees in frequencies 817-824/862-869 MHz (813.5-824/858.5-869 MHz in the counties listed in §90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section in any National Public Safety Planning Advisory Committee Region when all 800 MHz public safety licensees in the Region have completed band reconfiguration consistent with this part. In any National Public Safety Planning Advisory Committee Region where the 800 MHz band reconfiguration is incomplete, EA-based licensees in frequencies 817-821/862-866 MHz (813.5-821/858.5-866 MHz in the counties listed in §90.614(c)) may exceed the standard channel spacing and authorized bandwidth listed in paragraph (b)(5) of this section. Upon all 800 MHz public safety licensees in a National Public Safety Planning Advisory Committee Region completing band reconfiguration, EA-based 800 MHz SMR licensees in the 821-824/866-869 MHz band may exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section. Licensees authorized to exceed the standard channel spacing and authorized bandwidth under this paragraph must provide at least 30 days written notice prior to initiating such service in the bands listed herein to every 800 MHz public safety licensee with a base station in an affected National Public Safety Planning Advisory Committee Region, and every 800 MHz public safety licensee with a base station within 113 kilometers (70 miles) of an affected National Public Safety Planning Advisory Committee Region. Such notice shall include the estimated date upon which the EA-based 800 MHz SMR licensee intends to begin operations that exceed the channel spacing and authorized bandwidth in paragraph (b)(5) of this section.

Test date: 2016-06-21

Test results: Pass

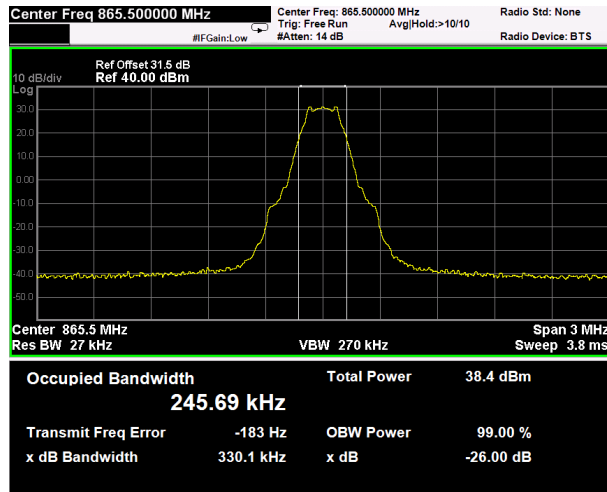
### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

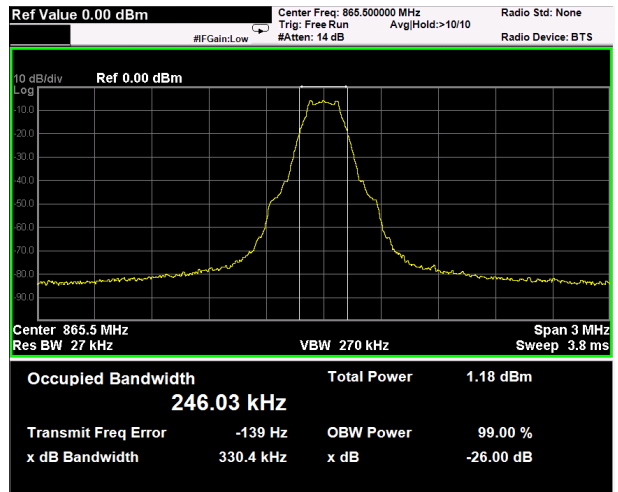
## Clause 90.209 Occupied bandwidth, continued

### Test data

#### MSK signal, nominal input signal

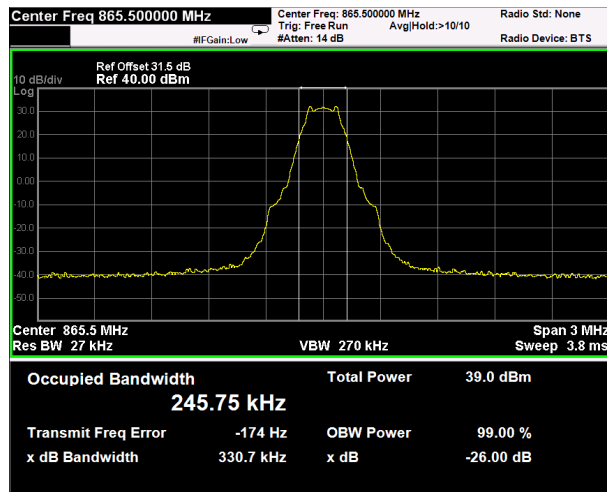


Output

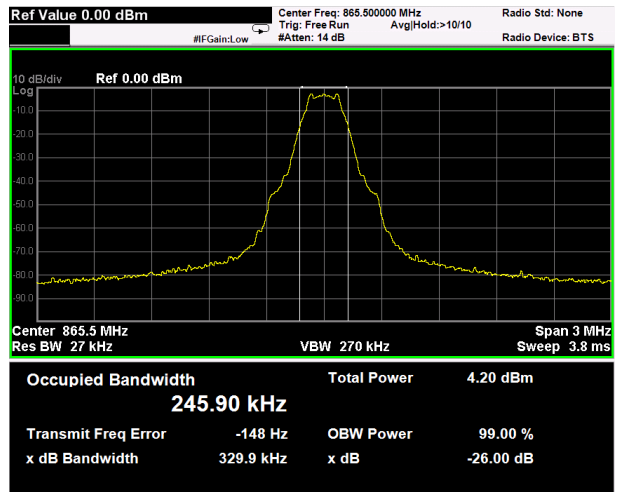


Input

#### MSK signal, nominal input signal + 3dB



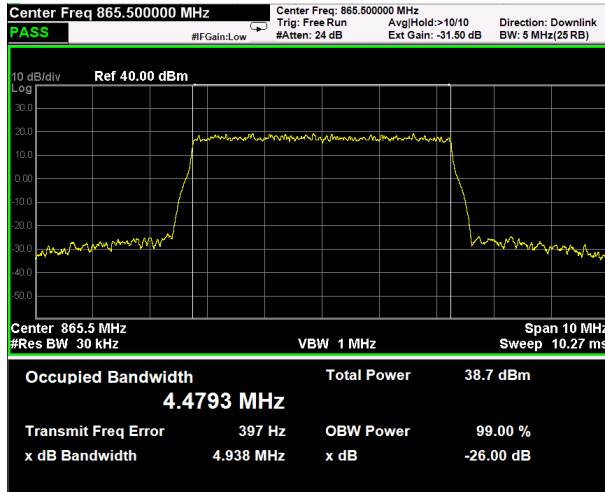
Output



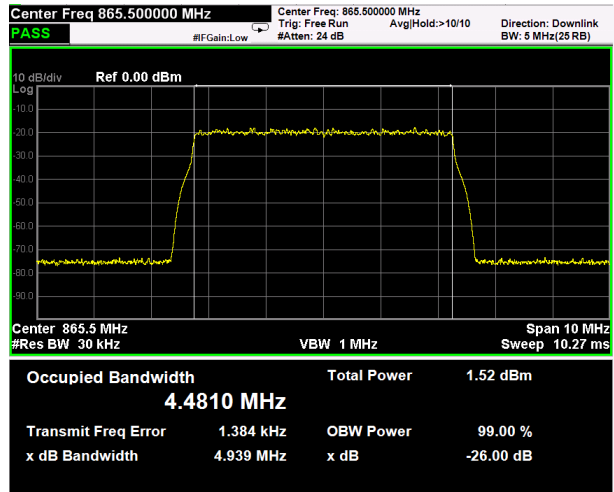
Input



## AWGN signal, nominal input signal

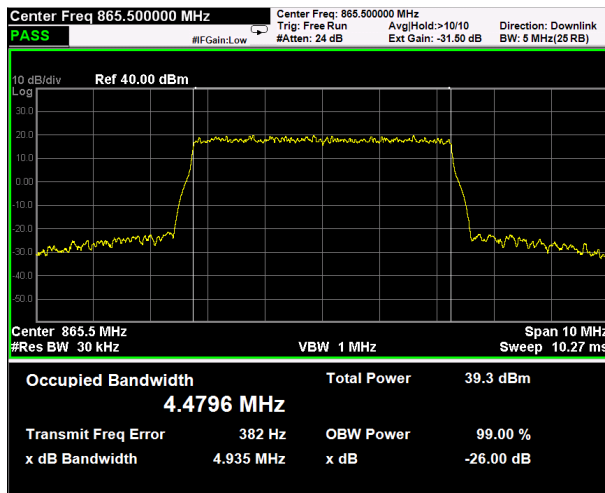


Output

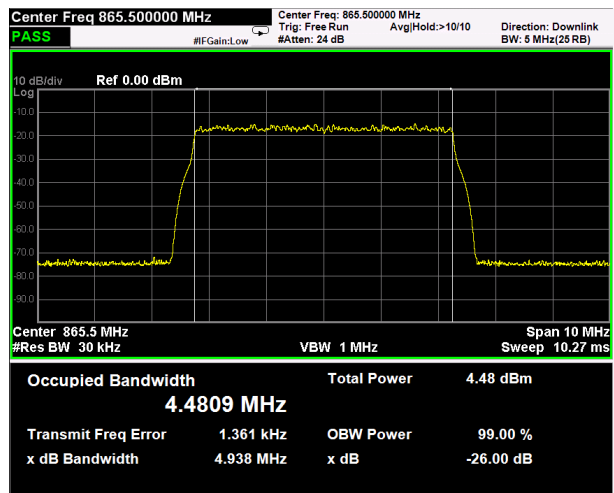


Input

## AWGN signal, nominal input signal + 3dB



Output



Input

## Clause 90.205 Peak output power at RF antenna connector

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows:

(k) 806-824 MHz, 851-869 MHz, 896-901 MHz and 935-940 MHz. Power and height limitations are specified in §90.635

### §90.635 Limitations on power and antenna height.

(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.

For measurements conducted pursuant to paragraphs (a) and (b) of § 2.1046, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

Test date: 2016-06-21

Test results: Pass

### Special notes

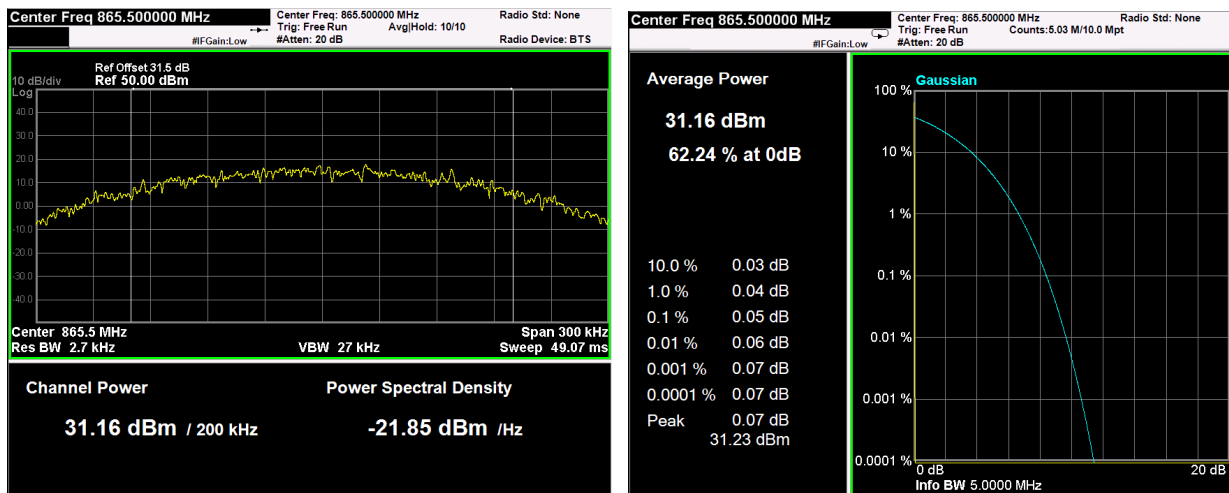
- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

## Clause 90.205 Peak output power at RF antenna connector

### Test data

#### MSK signal, nominal input signal

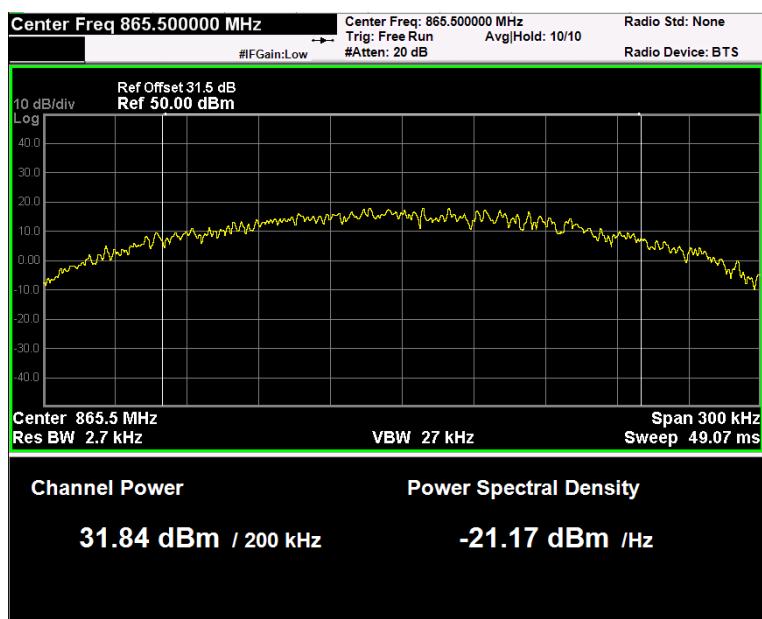
Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PAR (dB)
Down-link	MSK (GSM, 200kHz)	865.5	31.16	1,31	0,07



PAR measure is performed by the “CCDF” function installed on Spectrum analyzer that provides average power (the same measured with “Channel power” function), peak power and PAR.

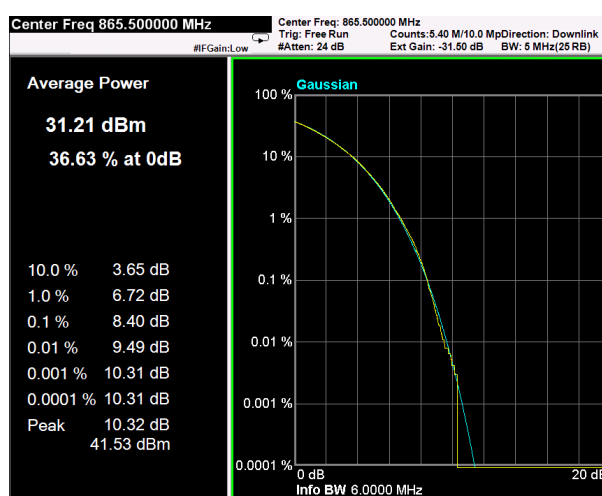
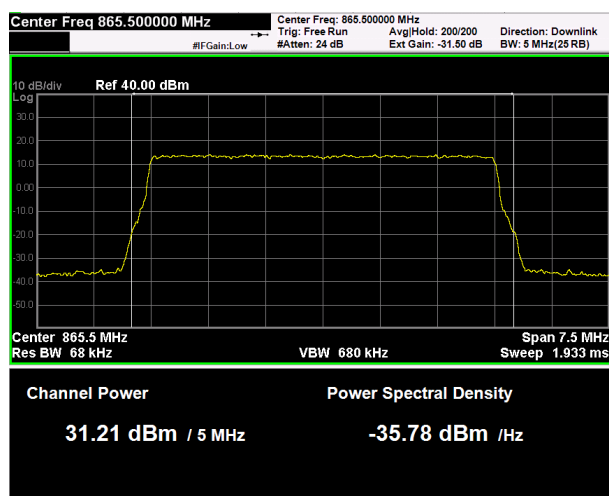
## MSK signal, nominal input signal + 3dB

Test data				
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)
Down-link	MSK (GSM, 200kHz)	865.5	31.84	1.53



## AWGN signal, nominal input signal

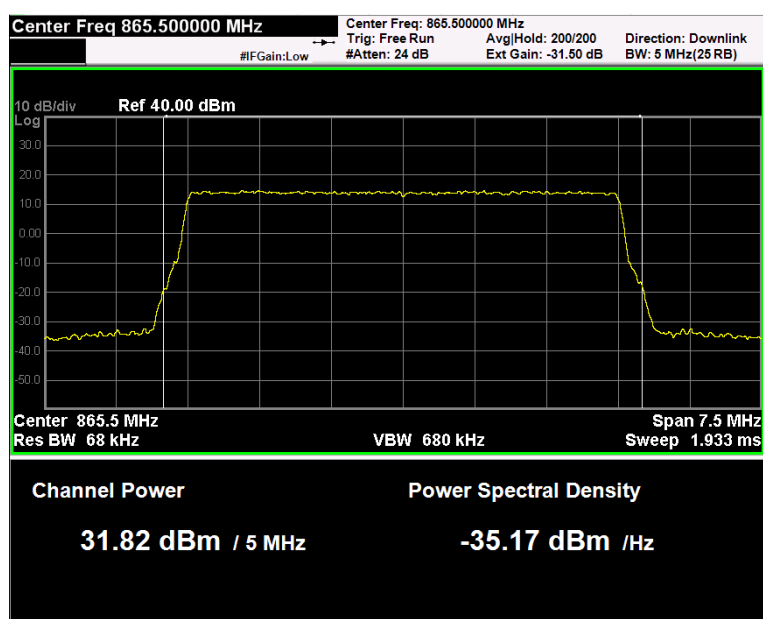
Test data					
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)	PAR (dB)
Down-link	AWGN (LTE, 5MHz)	865.5	31.21	1.32	10.32



PAR measure is performed by the “CCDF” function installed on Spectrum analyzer that provides average power (the same measured with “Channel power” function), peak power and PAR.

## AWGN signal, nominal input signal + 3dB

Test data				
Direction	Modulation	Frequency (MHz)	RF output Power (dBm)	RF output channel Power (W)
Down-link	AWGN (LTE, 5MHz)	865.5	31.82	1,52



## Clause 90.210 Spurious emissions at RF antenna connector

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

(g) Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

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

Test date: 2016-06-21

Test results: Pass

### Special notes

- Narrowband amplifiers: MSK test signal used (GSM-TDMA signal)
- Broadband amplifiers: AWGN test signal used (5 MHz LTE channel)

## Clause 90.210 Spurious emissions at RF antenna connector, continued

## Test data

See Plots below

## Spurious emissions measurement results:

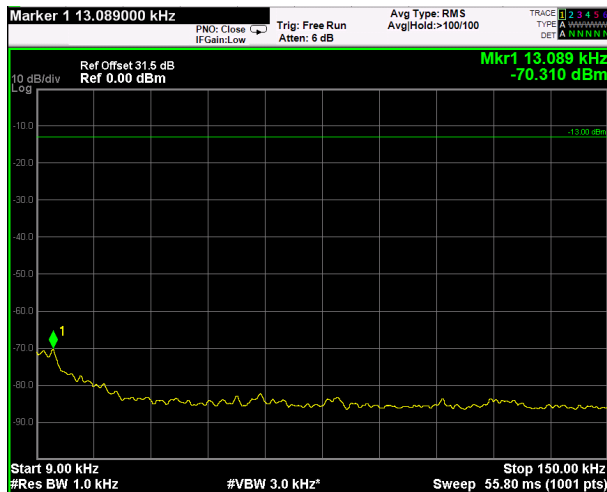
Frequency (MHz)	Spurious emission (dBm)	Limit (dBm)	Margin (dB)
Low channel			
First channel	Negligible	-13	
Mid channel			
856,5 MHz	Negligible	-13	
High channel			
Last channel	Negligible	-13	



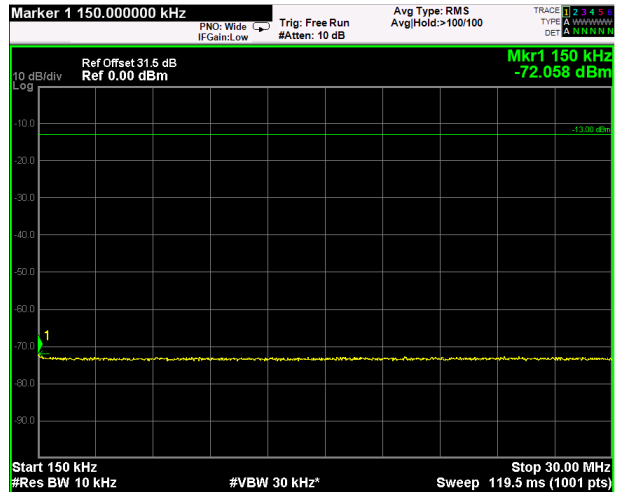
## Test data: spurious emissions at antenna terminal

## MSK signal

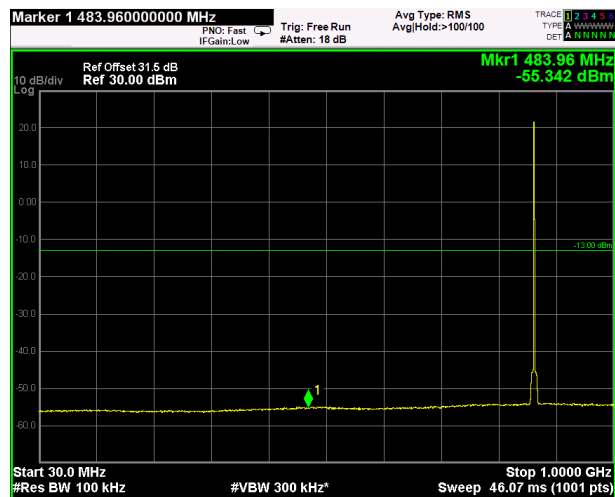
(Plots are referred to modulated carrier at the Middle Channel)



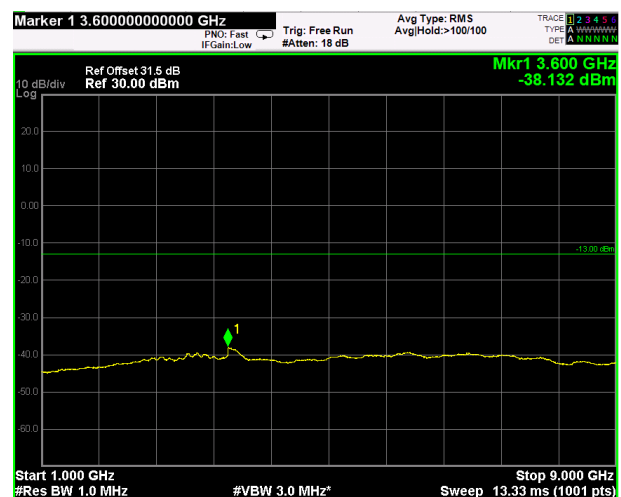
9kHz-150kHz



150kHz-30MHz



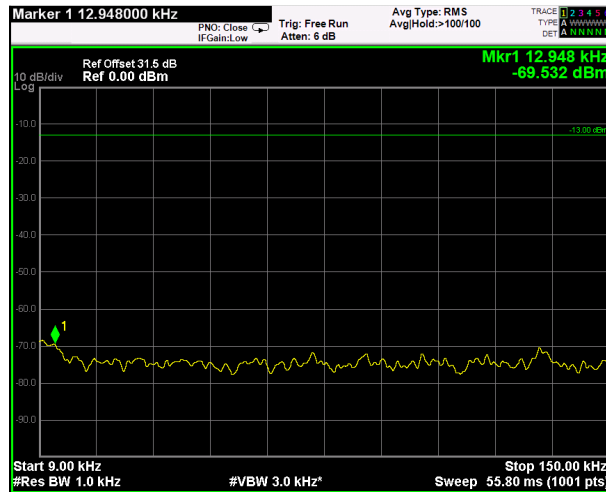
30MHz-1GHz



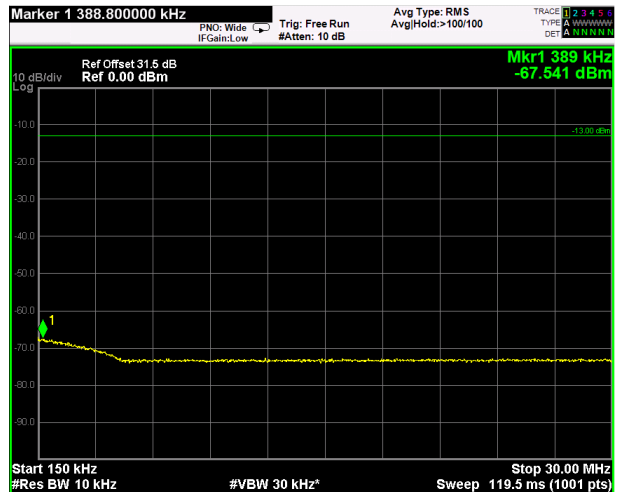
1GHz-9GHz

## AWGN signal

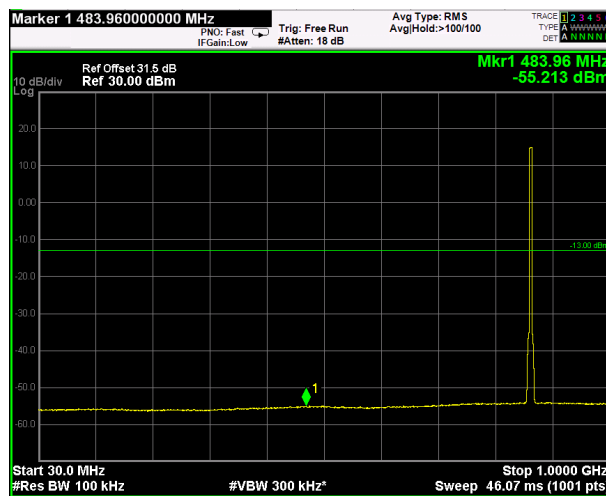
(Plots are referred to modulated carrier at the Middle Channel)



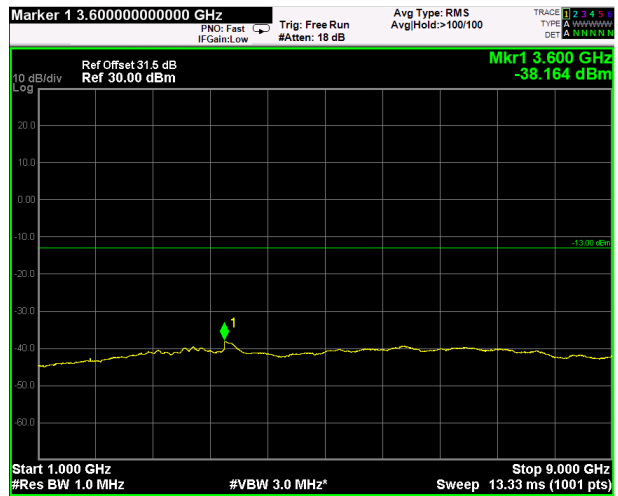
9kHz-150kHz



150kHz-30MHz



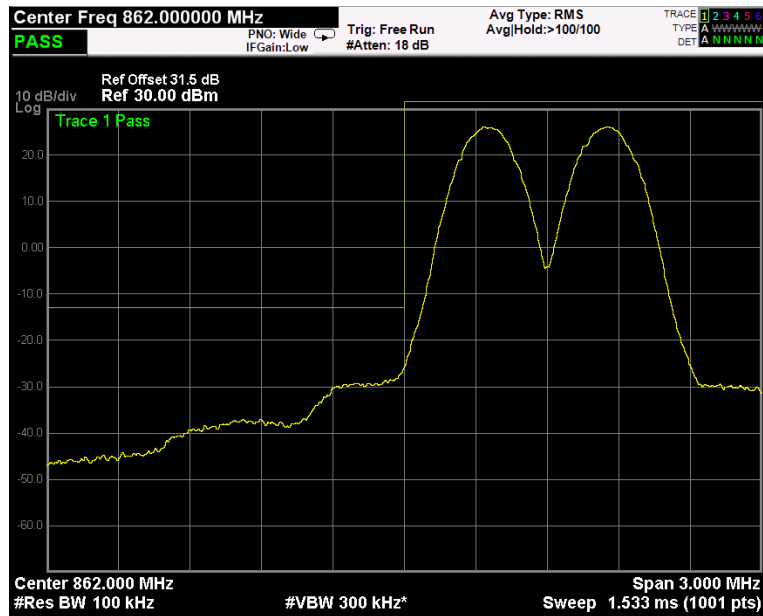
30MHz-1GHz



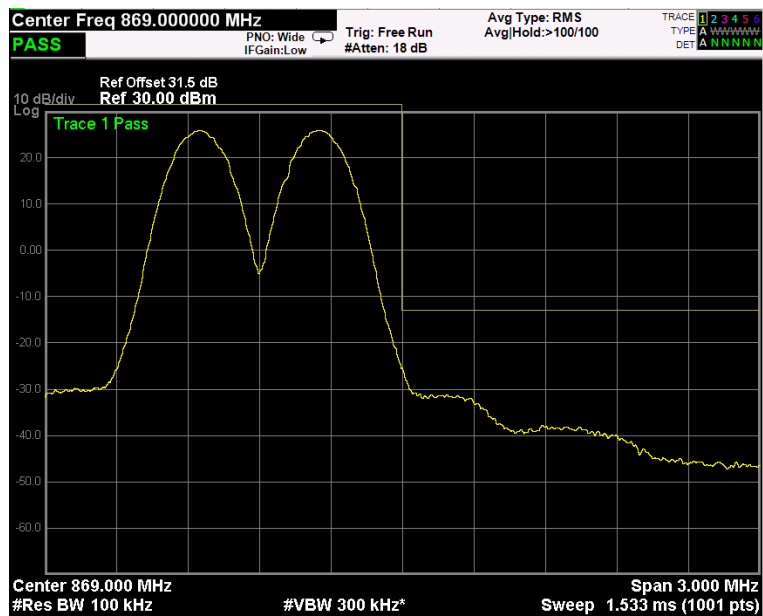
1GHz-9GHz

## Test data, continued: band edges Inter modulation

## MSK signal, nominal input signal

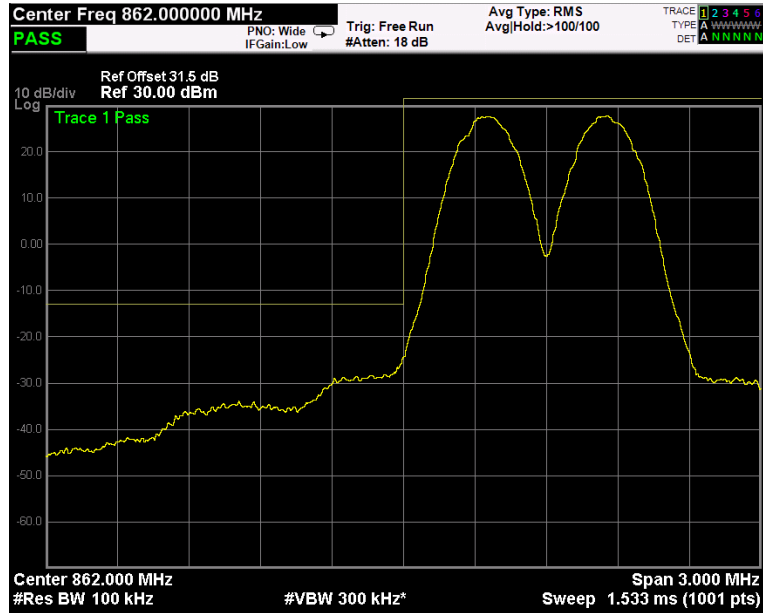


Low Band Edge

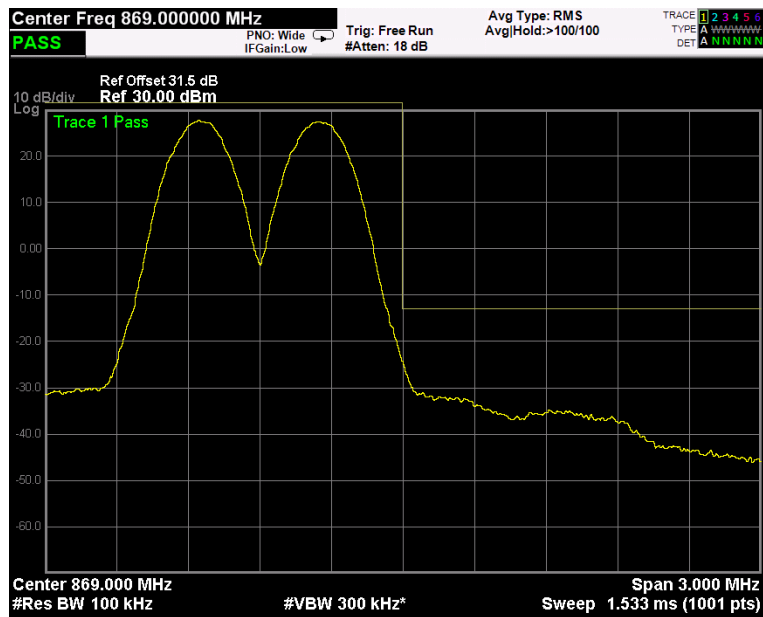


High Band Edge

## MSK signal, nominal input signal + 3dB

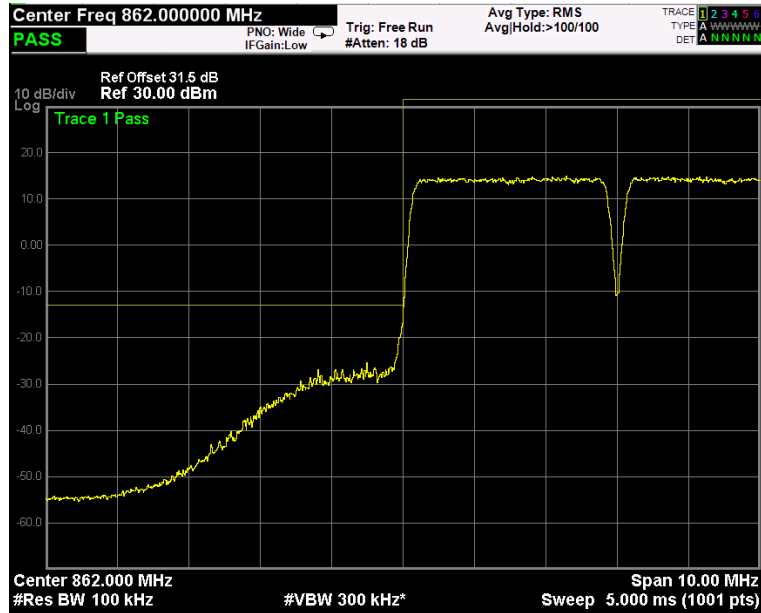


Low Band Edge

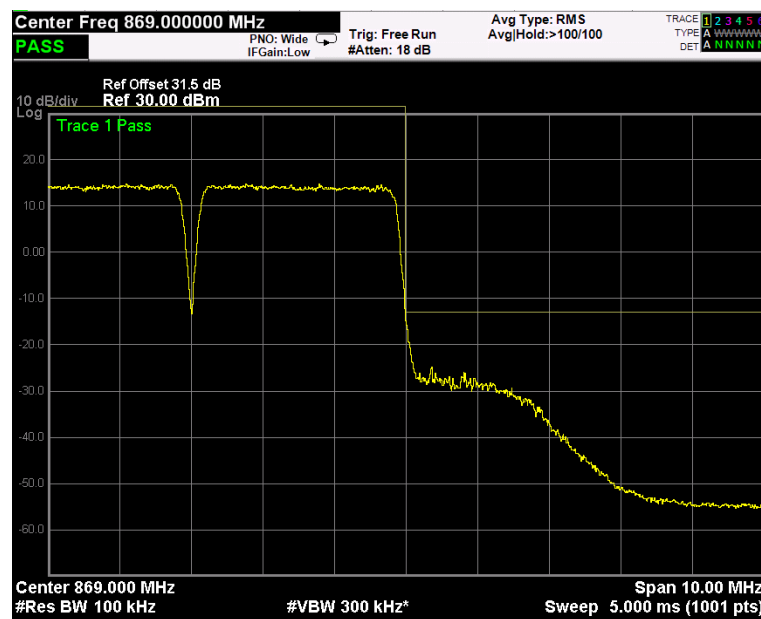


High Band Edge

## AWGN signal, nominal input signal

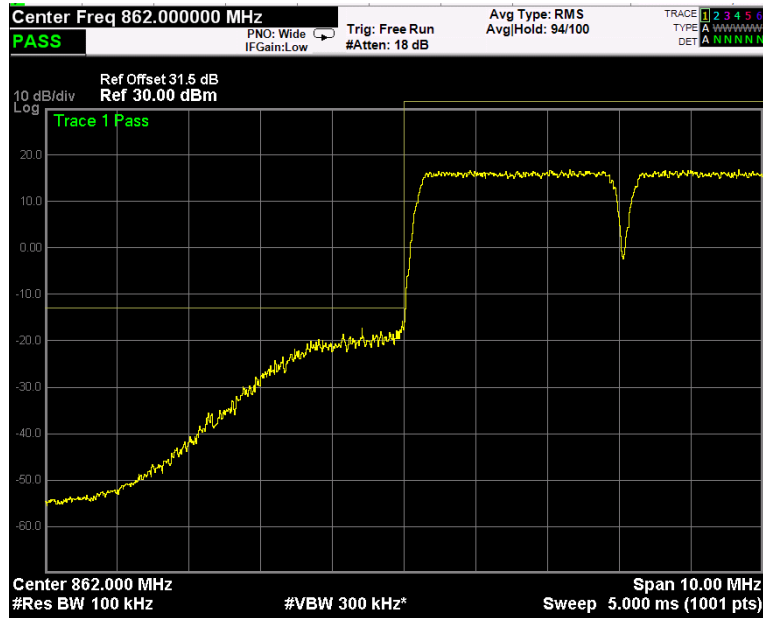


Low Band Edge

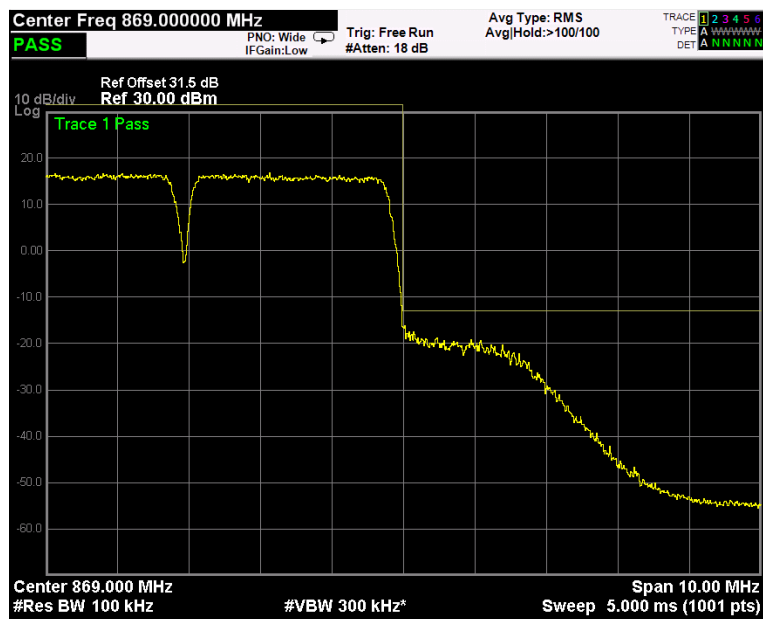


High Band Edge

## AWGN signal, nominal input signal + 3dB



Low Band Edge



High Band Edge

## Clause 90.210 Radiated Spurious emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

- (g) Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

Test date: 2016-06-20/21

Test results: Pass

### Special notes

## Clause 90.210 Radiated spurious emissions, continued

### Test data

The D.U.T. was positioned according to the radiated emissions set-up

The D.U.T. antenna connector was terminated by a 50  $\Omega$  shielded dummy load.

The spectrum was searched from 30 MHz to 1 GHz (RBW 100 kHz) & 1 GHz (RBW 1 MHz) to the tenth harmonic of the carrier.

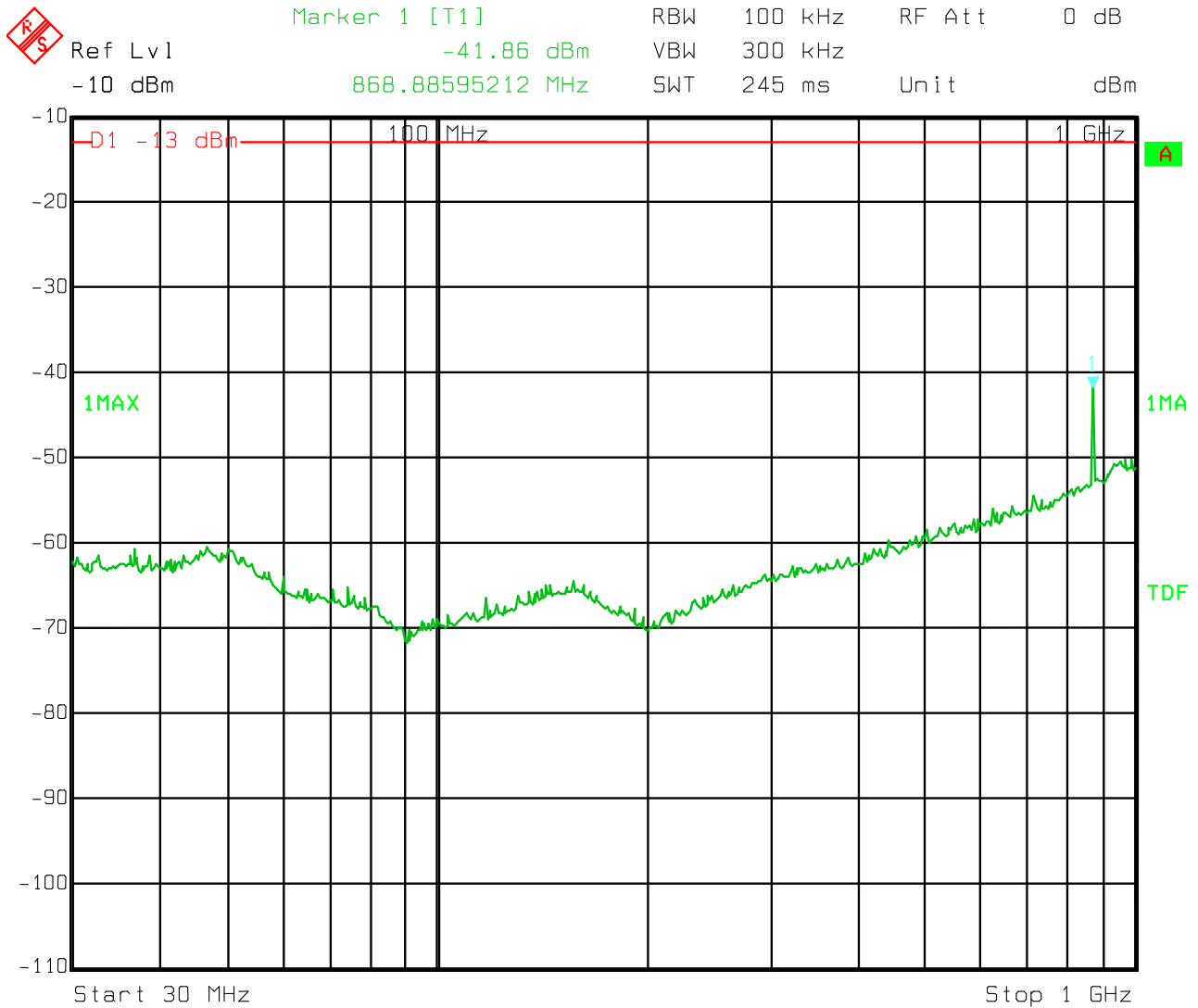
There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

### Spurious emissions measurement results:

Frequency (MHz)	Polarization. V/H	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
Low channel				
Mid channel				
High channel				

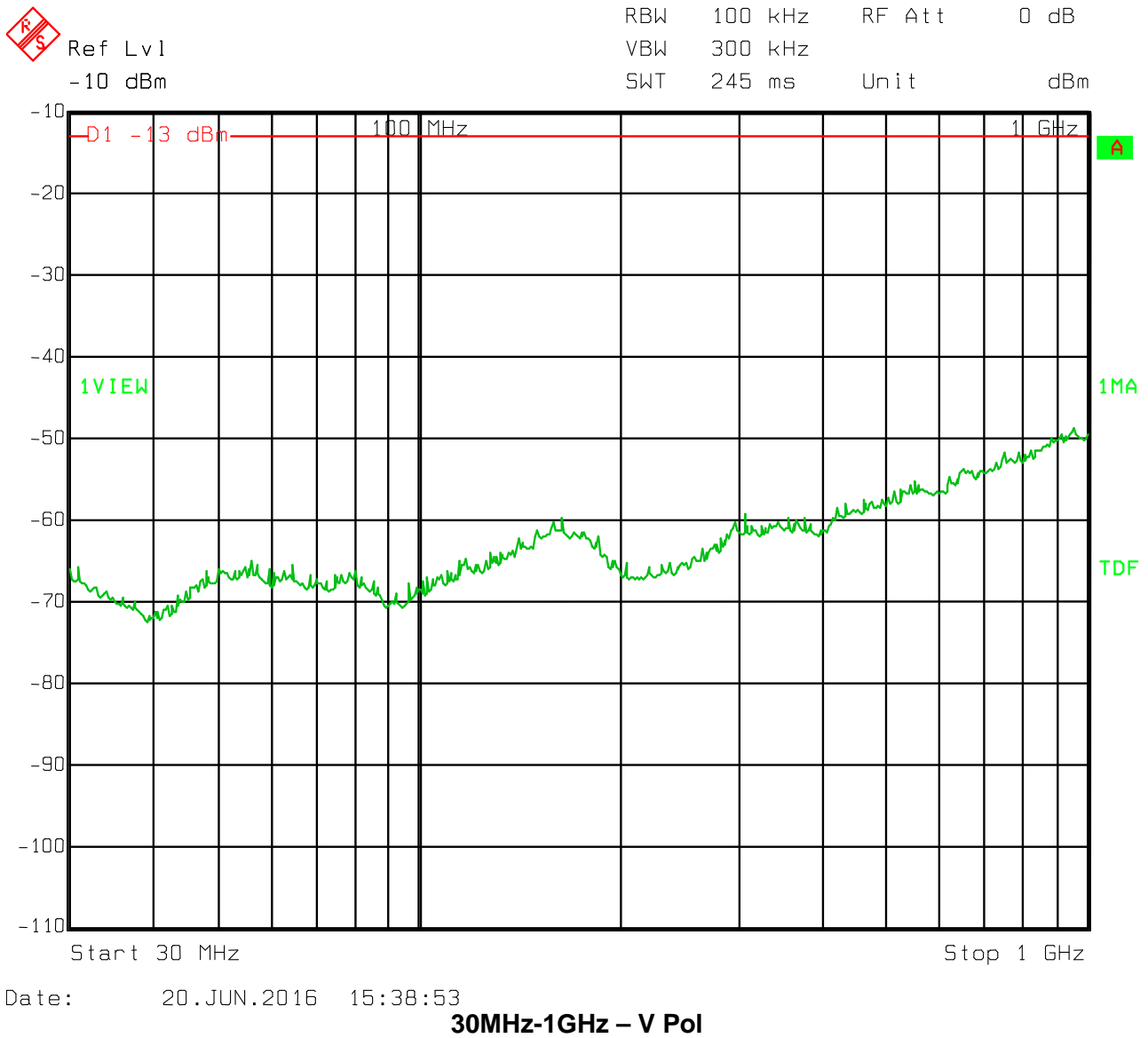
Note: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

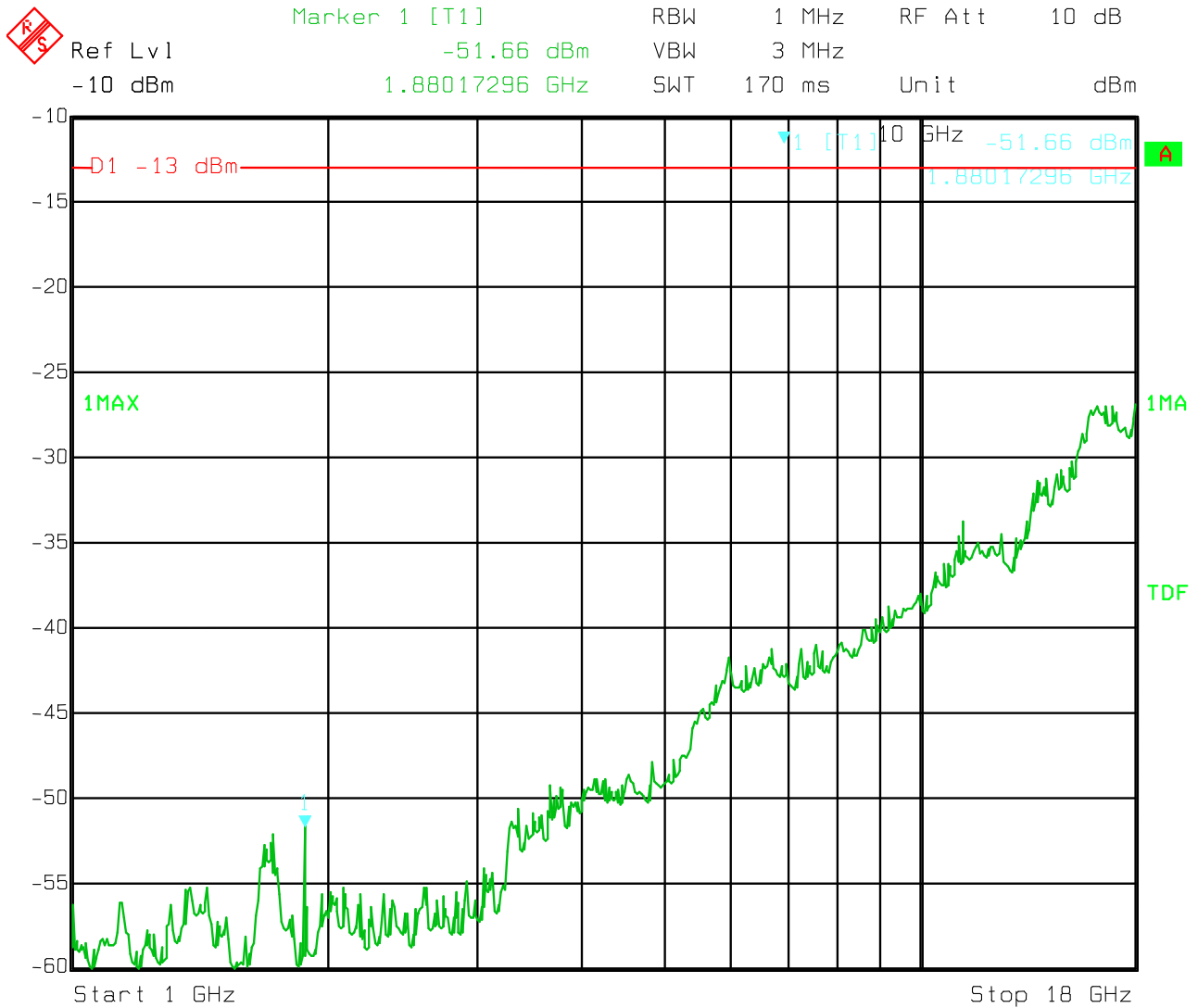




Date: 20.JUN.2016 15:41:05

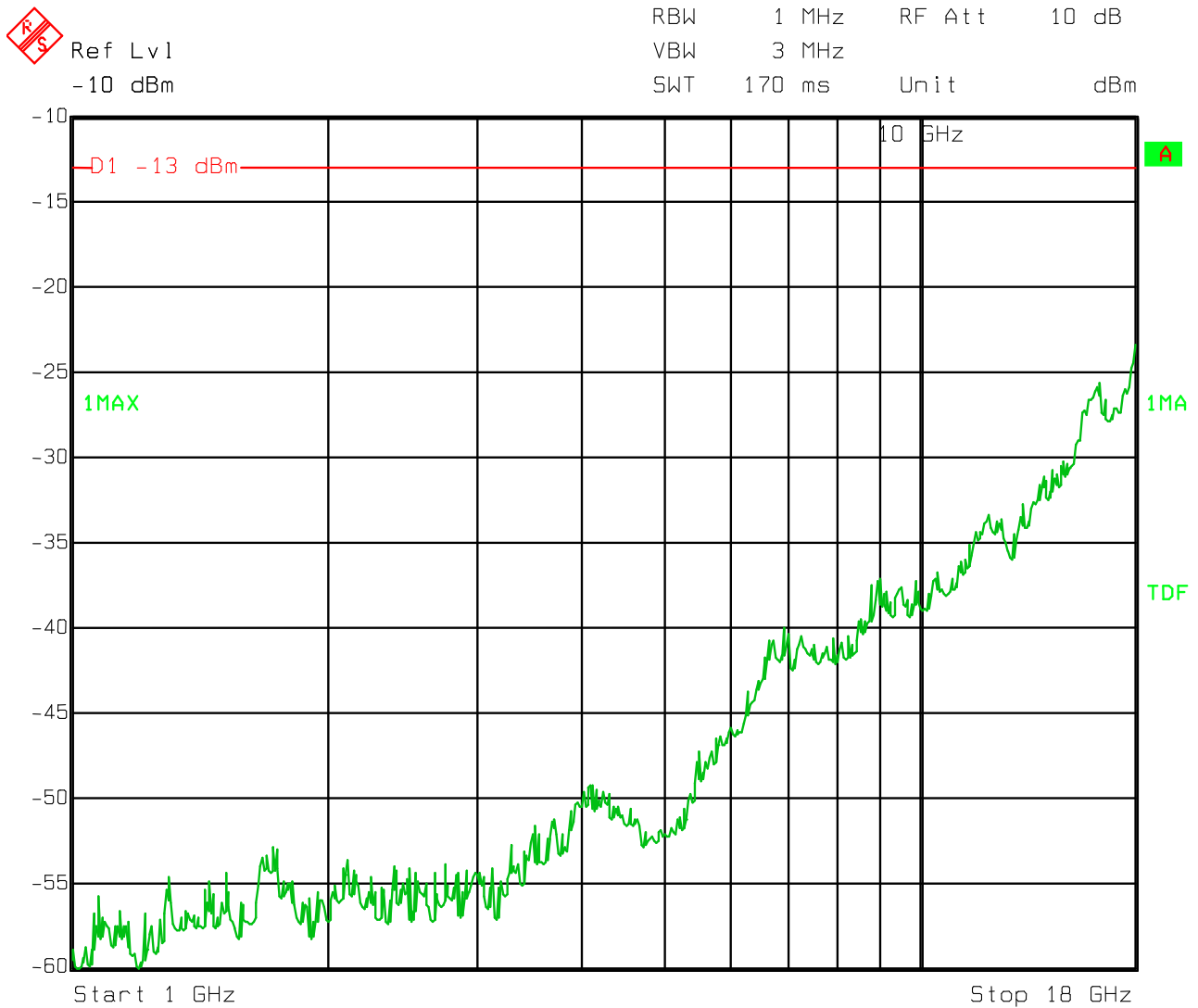
30MHz-1GHz – H Pol





Date: 21.JUN.2016 06:53:51

1GHz-18GHz – H Pol

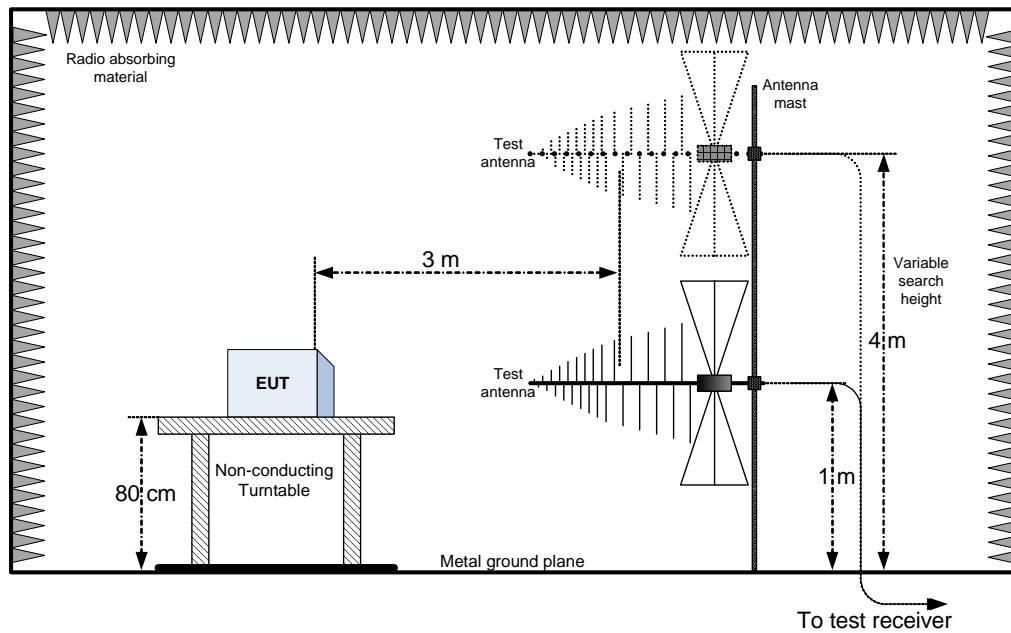


Date: 21.JUN.2016 06:56:58

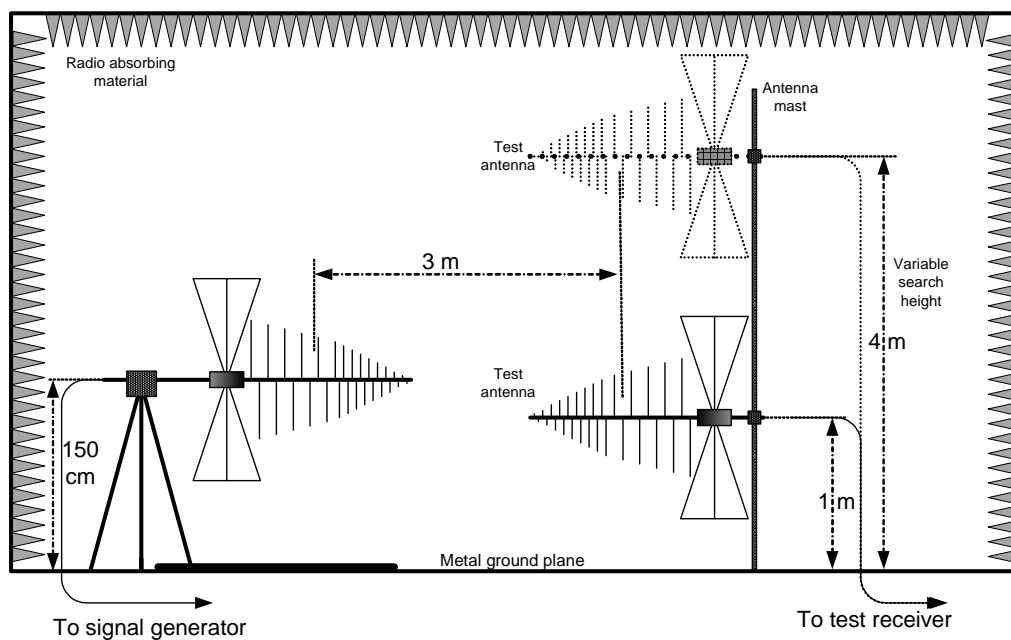
1GHz-18GHz – V Pol

## Appendix B: Block diagrams of test set-ups

### Radiated emissions set-up



### Substitution method set-up



## Appendix C: EUT Photos

### Photo Set up



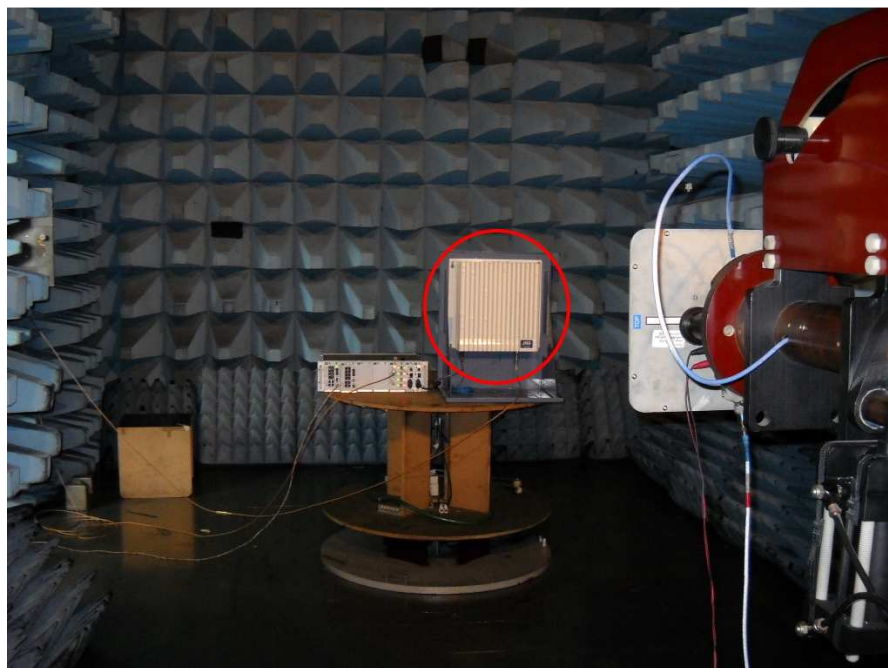
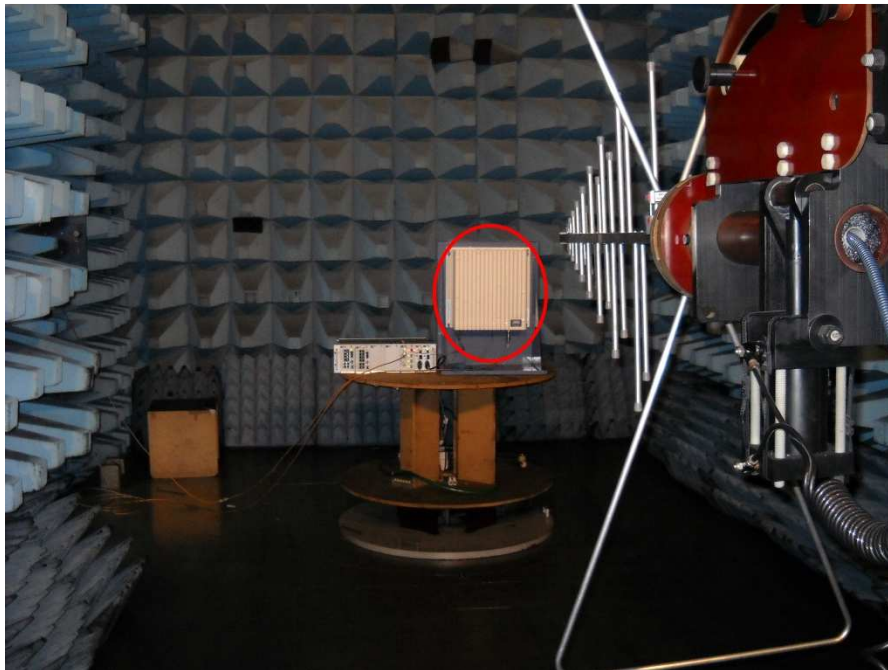




Photo EUT





